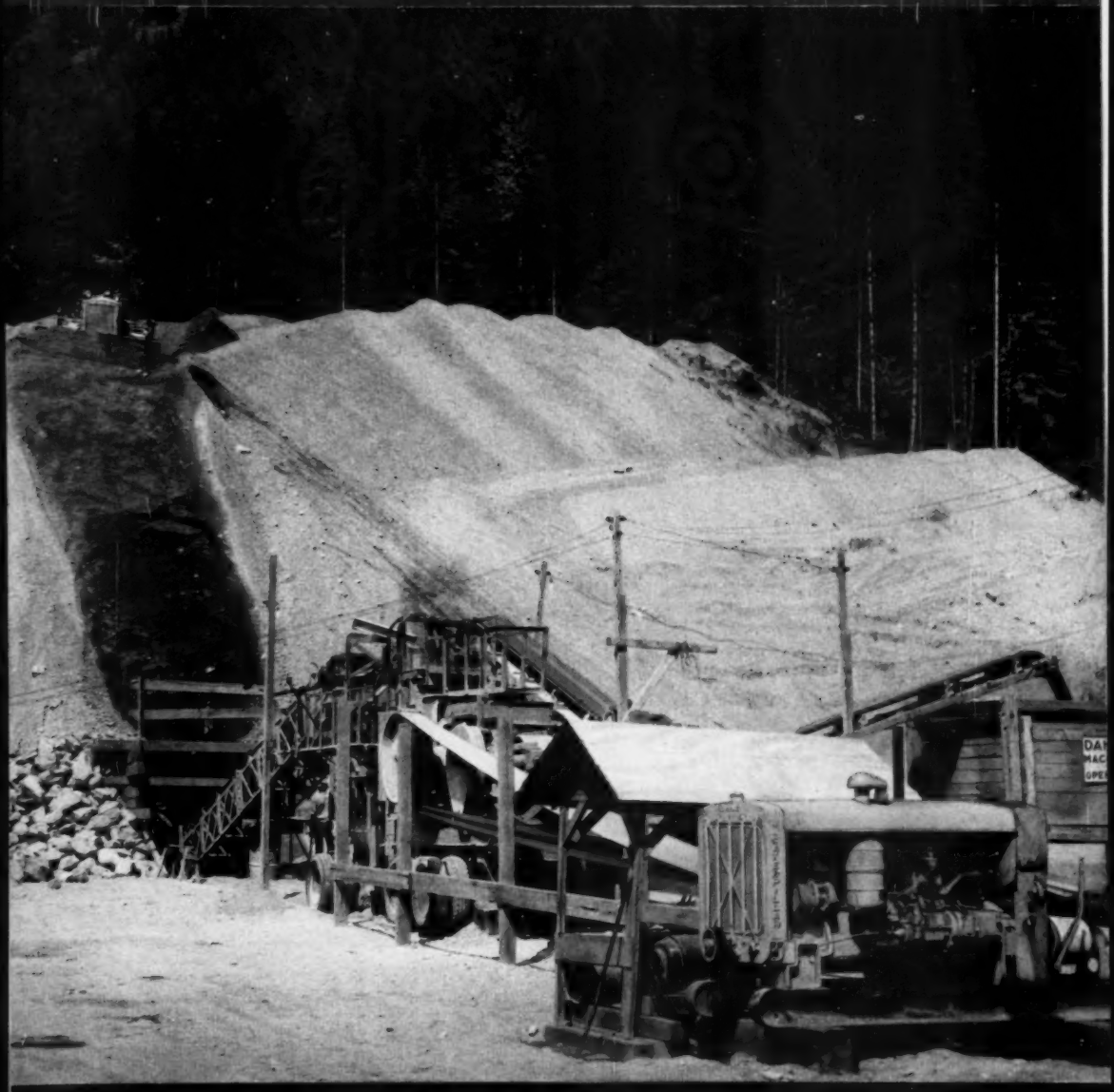
APRIL 1951

INDUSTRY AND POWER

The Magazine for the Plant Engineering Group



CONSERVATION PLAN FOR INDUSTRIAL RUBBER PRODUCTS

Conveyers • Transmission Belts • Hose • Packing - See Page 85

Cover - See Page 74

Only HARTZELL Fans Give You ALL These Advantages

MOTOR BASE SUPPORT RODS DOUBLE WELDED TO RING
WELDS
CURVED ORIFICE
WELDED ROD REINFORCEMENTS
MOUNTING LUGS WELDED TO RING
STURDY, RESILIENT MOTOR SUPPORT
FAMOUS EXCLUSIVE HARTZELL AIR-SEAL RING
SUPPORT RODS WELDED TO MOTOR BASE
CAST ALUMINUM ALLOY PROPELLERS
FORMED SHEET STEEL MOTOR BASE
STANDARD-MAKE MOTORS, NEMA FRAMES

The rugged construction of Hartzell fans and blowers makes them especially attractive to the industrialist who insists on dependable operation with practically no attention. Hartzell uses nothing but the best, from long-hour duty motors to corrosion-resistant paint. Designed and built to deliver maximum air per power dollar and to avoid the outages which cost so much in production. If you need industrial fans between one foot and 22 feet in diameter, of any type, or blowers efficient against up to 8" water gauge, there is Hartzell equipment ideal for your use. (Only Hartzell makes the 22-foot fan, moving 1,250,000 feet of air per minute). *Whatever* your air-moving need, sign and mail the coupon below *now*.

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PROPELLER FAN CO.

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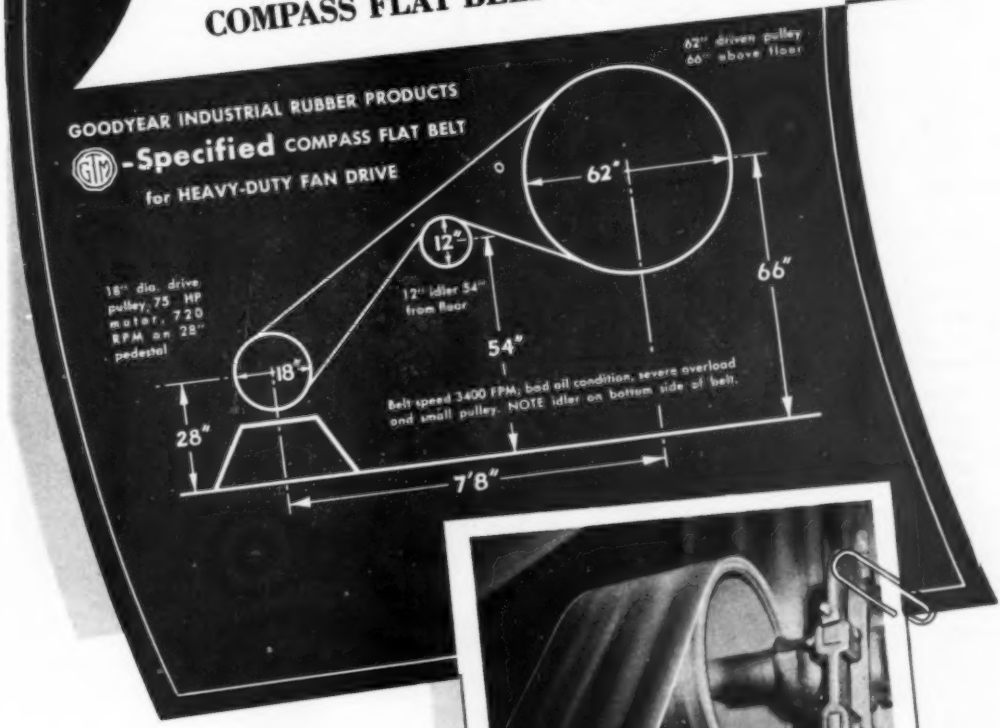
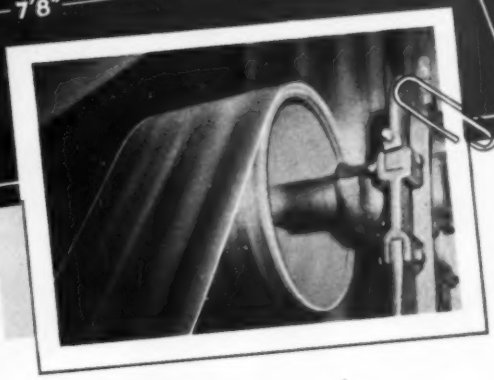
on a tough fan drive

Ordinary belt on heavy drive *lasted 6 months*
G.T.M.–Goodyear Technical Man–specified
COMPASS FLAT BELT–*running 4 years so far!*


GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GTM-Specified COMPASS FLAT BELT
for HEAVY-DUTY FAN DRIVE
62" driven pulley
66" above floor
62"
12"
66"
18" dia. drive pulley, 75 HP motor, 720 RPM on 28" pedestal
12" idler 54" from floor
54"
18"
28"
Belt speed 3400 FPM; bad oil condition, severe overload and small pulley. NOTE idler on bottom side of belt.
7'8"



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INDUSTRY AND POWER

The Magazine for the Plant Engineering Group

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Cover Illustration

Pioneer duplex crushing plant set up near Hope, B. C., in the Canadian Rockies is belt driven by "Caterpillar" D13000 diesel. Conservation and maintenance of transmission belting is featured in this issue; see pages 74 and 85. Cover—Courtesy of the Caterpillar Tractor Company, Peoria, Ill.

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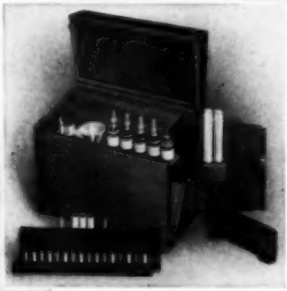
Only Taylor Comparators give
PERMANENTLY GUARANTEED COLOR STANDARDS for Testing
pH, Phosphate



Simply place reagent treated sample in middle tube in base, move the color standard slide until colors match and . . .

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There's no danger of mechanical inaccuracy when you use a Taylor Comparator for determining pH or phosphate in boiler water . . . because *all Taylor liquid color standards carry an unlimited guarantee against fading.*

One sturdy plastic slide houses all color standards necessary for any one determination. Each Boiler Water Set is packed in light-weight, convenient carrying case with base, slides, reagents and accessories. The utility of these sets is high, but their cost is low!

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Write direct for your free copy of "Modern pH and Chlorine Control" if this valuable reference is not already in your library. Gives theory and practice of modern boiler water testing, describes and illustrates Taylor equipment.

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Acorns of Science

Developments not yet available, but of interest to the Plant Engineering Group as previews of future tools and methods

Radiographs with Cobalt

● Scientists at Armour Research Foundation are using an isotope, radioactive cobalt 60, to picture flaws in steel sections as much as 8 in. thick. Equal to $36,000 worth of radium in intensity, it also permits working in hard to reach places. Up to $100,000 worth of bulky X-ray equipment would be required to match its ability to find defects in castings, joints and assemblies.

Armor for Copper Wire

● Composite nickel-sheathed copper wire that is heat and corrosion resistant, has 70 per cent the electrical conductivity of copper, and is stronger and tougher has been developed by the International Nickel Co., Inc.

Glass Furnace Element

● Heat radiated from a bath of molten glass has been used to heat steel forgings. The glass can be any type of scrap. It is first made conductive by preheating around immersed graphite electrodes. An electric current keeps the glass molten, permits maintenance of temperatures up to 2700 F by radiated heat.

Shrink Counteracts Pressure

● Arsenals use shrunken cylinders to produce compressive stresses which help withstand bursting pressure in big guns. Harwood Engineering Co., Inc. has used the principle in a tapered-shrink construction to design intensifiers, pipe and fittings capable of delivering pressures up to 200,000 psi (ranges up to 150,000 psi are being explored for production processes). High-strength nickel alloys are essential to design of high-pressure equipment such as fittings, pipes and tanks.

Silver in Soft Solder

● Substitute solders are back because of tin shortage. Outgrowth of the series developed during the last war, a group of solders reported by a metals conservation committee of American Smelting and Refining Co. gives equal working and joint efficiency at lower cost than the equivalent standard tin-lead solders. Small quantities of silver allow large reduction of tin, permit use of same fluxes and techniques, require only slightly more heat.

Salt Scale Reduced

● Military distillation unit for supplying fresh water from the sea reduces scale formation 95 per cent by use of a contact stabilizer. Filled with sand or limestone, the stabilizer absorbs most of the salt usually deposited in evaporator tubes by offering greater contact surface. Stabilizer is a result of basic research at the University of California. The 1250 gph unit runs 3000 hr without scale removal. Output is 250 lb of water for each pound of fuel.

Synthetics Bring New Fiber

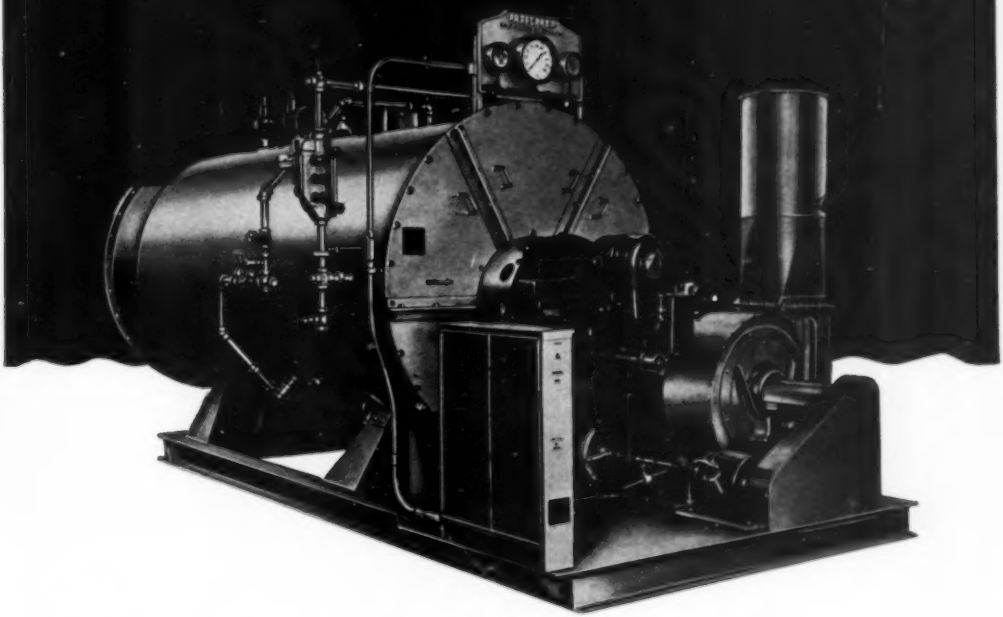
● Amilar is the new name of a polyester textile fiber, one of the more recent Du Pont developments, now undergoing research and evaluation for use in fire hose, V-belts and other industrial applications. Not chemically related to nylon or other Du Pont fibers, outstanding properties are high tensile strength and resistance to stretching, degradation by chemical bleaches and to abrasion. Electrical insulation properties are good and not weakened by fungus, mold or mildew. Wet or dry, most properties of the new fibre remain unchanged.

Isotopes and Steel

● Reports on experiments on steel using radioactive isotopes are brought up to date by AISI. Studies on carbon distribution, segregation and hardening mechanisms use carbon 14. Other studies with isotopes trace changes of metal during heat-treatment and diffusion of solid iron during annealing, hardening, recrystalization. Rate of wear is found accurately in friction studies. Improved metals may also be expected from such experiments as on ionic properties of slags, formation of scale, segregation of tungsten. Most projects are in laboratories remote from steel plants so radioactive tracers used will not "poison" industrial steel.

Still leads the field

PREFERRED UNIT STEAM GENERATOR

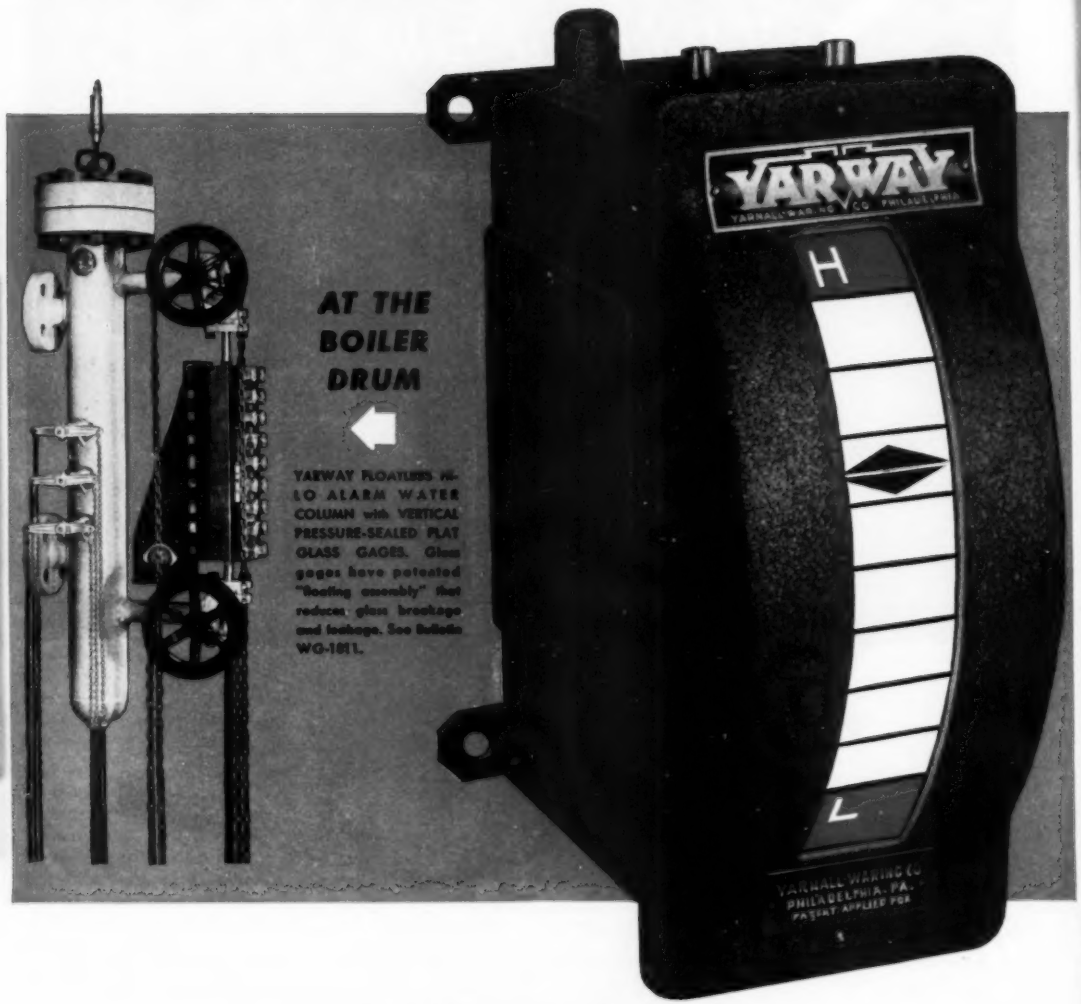


IT'S A FACT—the finest unit steam generator costs the least over its entire life span. That's why Preferred has never lowered the quality of its product to lower the first cost. This accent on progressive engineering not only insures Preferred's leadership in its field, but also gives you—the buyer—true boiler economy • Such features as the anti-stress deck, staggered tube construction and special precipitator are your assurances of at least 25 years of efficient, economical, maintenance-free service at a minimum efficiency of 80%.

Write for bulletin giving complete details.

PREFERRED UTILITIES MANUFACTURING CORP.
1860 BROADWAY, NEW YORK 23, N. Y.

Boiler Water Indication


AT THE BOILER DRUM
YARWAY FLOATLESS HI-LO ALARM WATER COLUMN with VERTICAL PRESSURE-SEALED FLAT GLASS GAGES. Glass gages have patented "floating assembly" that reduces glass breakage and leakage. See Bulletin WG-1811.
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YARNALL-WARING CO PHILADELPHIA, PA.
PATENT APPLIED FOR

YARWAY

ON THE LEVEL with a Yarway System

It's accurate! It's where you can see it!

These two most important needs for boiler water level indication are assured with a Yarway system.

Yarway indicating equipment is accurate because it is *operated directly by the boiler water itself*. Yarway Weight-operated Hi-Lo Alarm Water Columns with either Seaure Inclined or Flat Glass Vertical Gages take care of the job at the boiler drum. On the instrument panel or other desired location, Yarway Remote Liquid Level Indicators bring overhead gage readings down to convenient, easy eye-level vision. By use of a Control Unit on the indicator, additional Hi-Lo light or sound alarms can be located at any place in the plant.

The Yarway HI-LO-GRAPH, a panel-mounted *recording* indicator, gives a 24-hour record of boiler water levels.

Yarway engineers will gladly show you how the Yarway Boiler Water Indicating System increases power plant *safety* and *efficiency*.

For the full story on Yarway Indicators, write for a free copy of Yarway Bulletin WG-1822.

YARNALL-WARING COMPANY, 109 Mermaid Avenue, Philadelphia 18, Pa.

BRANCH OFFICES IN PRINCIPAL CITIES

ON THE INSTRUMENT PANEL

YARWAY REMOTE LIQUID LEVEL INDICATOR, operated directly by the boiler water itself, by the pressure differential between a constant head and the varying head in the boiler drum. Indicating mechanism is never under pressure—no stuffing boxes. See Bulletin WG-1822.

YARWAY HI-LO-GRAPH RECORDER provides not only instant indication but also 24-hour recording of boiler water levels. See Bulletin WG-1820.

ANYWHERE IN THE PLANT

YARWAY REMOTE HI-LO ALARM SIGNALS, lights or horns. Operated by Control Unit attached to Remote Liquid Level Indicator or Recorder. Any number can be installed, at any desired locations throughout the plant. See Bulletin WG-1822.

new equipment and developments

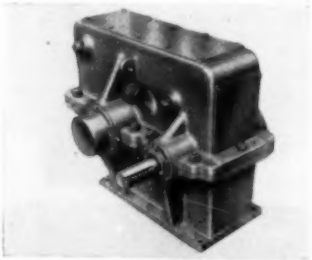
You can easily get more data on these new equipment and development items. Use the handy, postage-free order cards on Page 101. Just list the key numbers of the descriptive paragraphs in the spaces provided on the card and mail.

1—GEAR HEAD MOTOR FAN COOLED

Sterling Electric Motors, Inc., have recently introduced their latest electric power drive development, the Slo-Speed (geared head) totally enclosed fan-cooled motor with a mounted disc type brake, which can be supplied for either stopping or holding service. Both are totally enclosed and dust tight, being especially designed for use in atmosphere containing non-explosive dust, vapors and other injurious foreign materials. Manufactured in ratings ranging from 2 to 15 hp and in A.G.M.A. speeds from 280 to 30 rpm, inclusive. These motors have labyrinth seals, the Sterling patented herringbone rotor, and a simplified gear system in a balanced design from power intake to drive shaft.

2—LOAD BRAKE HAS POSITIVE CONTROL

An automatic mechanical load brake designed for use with cranes and other hoisting equipment has just been announced by the Downs Crane and Hoist Co. It provides a positive control on the lowering speed of the load and will hold in any position independent of any other brakes in the hoisting system. The hoist motor may be disconnected and removed with a full load hanging from the hoist without danger. Weight of the load acting through a helix produces an axial thrust, which clamps a ratchet wheel between two friction discs with sufficient pressure to prevent all rotation in the lowering direction. By operating the hoist motor in the lowering direction, the pressure on the helix is relieved and the brake opens, allowing the load to lower. When the hoist is operated in the upward or lifting direction, the pawls lift clear of the ratchet wheel by means of friction plugs, and the mechanism runs free.



3—COMPACT PUMP OPERATES TO 150 PSI

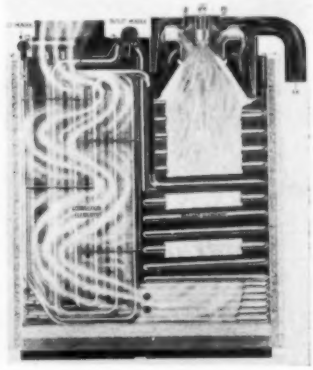
Eco Engineering Co. announces a line of pumps to be known as the M-3 that has an overall length of only 3-9/16 in. For its weight and size, the M-3 is said to deliver more liquid than any other type of pumping equipment. Designed for flange mounting, it pumps 1.65 gpm at 1750 rpm, operating against pressures up to 150 psi at higher speeds. Pumping is in either direction, and bearings require no lubrication. The pistons are made of resilient highest grade compounds and will withstand oils and kerosene. Available in naval bronze forgings, which last indefinitely and will not corrode.

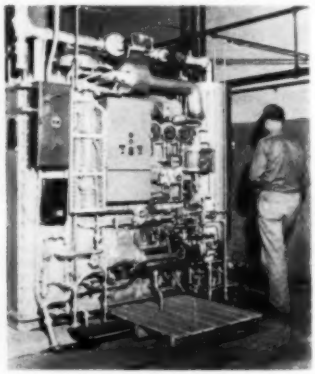
5—SAFETY FEATURES AIR CONTROL VALVE

Greater safety for operators is provided by an air control solenoid valve just introduced by Ross Operating Valve Co. The model, known as the Ross safety valve, was developed in cooperation with safety engineers. Even if the air or electrical supply should be interrupted, the valve is designed to move to a safe position. One feature is the elimination of all springs and this, together with the use of a clapper type solenoid, adds materially to operators' protection. The major pistons and poppets are tied together in one unit to assure simultaneous movement, and an over-size exhaust gives faster control. Free and continuous operation is provided by floating the pilot operating lever on needle bear-

4—STEAM GENERATOR COMES COMPLETE

A compact, reliable steam plant culminating a five-year period of research, development and operating experience is now being offered by Combustion Engineering-Superheater, Inc. Known as the "CE Controlled Recirculation" steam generator, it is actually a packaged self-contained steam plant that includes feedwater pump and control, fuel equipment and control, combustion control and safety devices, forced-draft fan, safety valves, circulating pump, and all other auxiliaries. Shipped from the factory as a complete assembly, it can be installed with the minimum of construction, and usually requires connection only to steam, fuel, water and electrical service outlets. It is available in several sizes for steam capacities from 2,800 to 6,000 lb of steam per hr and for operating pressures up to 300 psig. The generator may be fired by light or heavy fuel oil or by natural gas. The 6,000-lb capacity unit for burning light oil or gas occupies a space 6 ft 11 in. long, 5 ft 5 in. wide and 6 ft 11 in. high. The unit for burning heavy oil is only slightly larger.





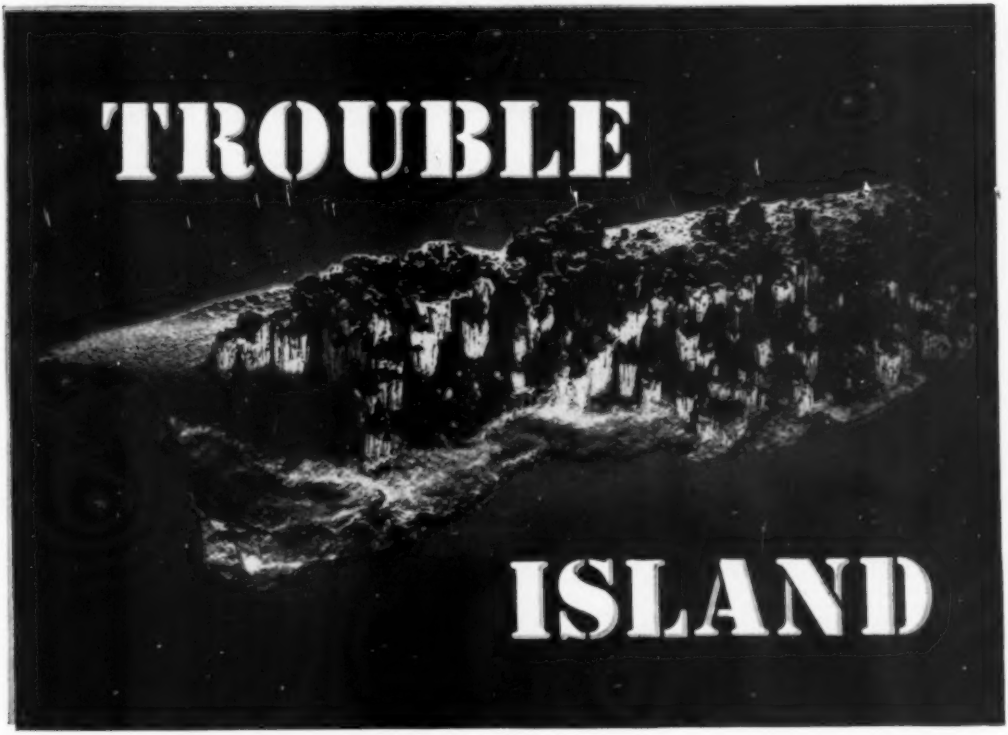


Photo is of a condenser-tube scale sample, about eight inches long. Solid scale is approximately ¼-inch thick, with "spires" ranging up to ⅜-inch height.

FIFTEEN years ago, this small island of trouble was part of a much larger open-box condenser problem at a refinery. Cooling water, running over 200°F. at outlet, contained 30 grains per gallon hardness and 20 parts per million iron. Tubes scaled heavily and rapidly without chemical inhibitor. Even with the best inhibitor then known, results were as illustrated above: partial inhibiting action creating the "spires" or forest-like deposits on tubes.

Considering this a challenge, Nalco sent a Doctor of Physical Chemistry — an expert water technologist — to the refinery. His weeks of work on the spot led to basically different treatment with new chemicals which cleaned up the condenser and kept it clean. Further Nalco research and development of chemical inhibitors has since enabled cooling systems to operate without scale or corrosion *with water hardnesses as high as 200 grains per gallon.*

Point is this: neither Nalco nor anyone else had an answer to scaling in that condenser. Nalco put the necessary brains to practical use and *got results* . . . benefiting, in the long run, not only that particular refinery, but every user of cooling water.

Whether your water treatment problem is unique, or stubborn plant-run, you will get prompt, decisive action from Nalco in the direction of positive results. Write or telephone today.

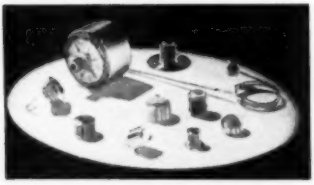
NATIONAL ALUMINATE CORPORATION
6218 W. 66th Place • Chicago 38, Illinois
Canadian inquiries should be addressed to
Alchem Limited, Burlington, Ontario

THE *Nalco* SYSTEM . . . Serving Industry through Practical Applied Science

ings. Current consumption is exceptionally low—0.56 amp holding and 4.3 amp inrush at 115/60 v. Ordinarily operates with line pressure of 40 to 125 psi, but it can be designed to work outside of these limits. Available in ¼ to 1¼ in. pipe sizes, straightway or 3-way, normally closed or normally open models.

6—BELLOWS AVAILABLE IN NUMEROUS METALS

Flexon bellows as manufactured by Chicago Metal Hose Corp. are available in a complete range of sizes and metals. The bellows are fabricated of brass, stainless steel, bronze, monel and inconel in single and multiple ply construction and in various lengths, dependent upon application requirements. They are specially suited for

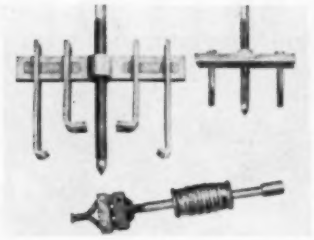


applications of control devices and instruments including regulators, valves, steam traps, shaft seals, expansion connections and flexible connectors for misalignment. A variety of fittings are provided to meet customer's specifications. Many types of attachments are available such as electrical circular seam welding of fittings to stainless steel bellows to give uni-metal assemblies. Other methods of attachment such as silver brazing and soldering can also be used.

7—WIDE APPLICATION PULLER SETS

Development of a PROTO master puller set and three smaller, high-utility puller sets has been announced by Plomb Tool Co. Master set No. 4000AB was designed for all types of vehicle, equipment and plant maintenance. It includes six basic pullers—heavy, medium, light, wheel, slide-hammer and bearing-separator types—and 28 supplementary parts. Hundreds of set-ups can be made because puller parts are

For more information use one of the convenient reply cards on page 101. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.



interchangeable. Set No. 4010C is a heavy-duty type with regular and capscrew jaws. It is especially suited for pushing out shafting, bearings, sleeves and sub-assemblies. Set No. 4020C has two capscrews and a slotted cross arm that permits a wide range of adjustments up to 6 in. Ideal for pulling harmonic balancer and pulley assemblies, timing gears and many other parts. Set No. 4056A is a slide-hammer type with a short rod and two long, narrow, high-strength jaws. Removes the clutch pilot bearings from fly wheels and handles practically all bearings with a bore of ⅝ to 1¾ in.

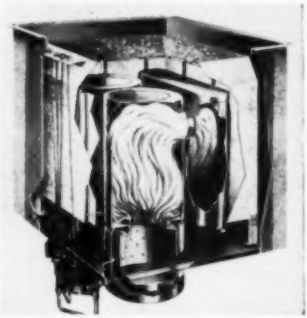
8—ALTERNATOR PROVIDES PRECISE VOLTAGE

American Electric Motors, Inc. has a compact single- or three-phase, high-frequency induction alternator that is equipped

with an electronic exciter regulator. Accuracy of voltage regulation is within plus or minus 1 per cent. Equipment can be supplied independent of line frequency fluctuations by making it self-excited through high-vacuum rectifiers. A variable-speed electric power drive provides the infinite speed variation, speed range and positive adjustment of pulleys that are required to assure accurate frequency selection over a wide range with a high degree of uniformity at any selected frequency. Alternator is available in sizes up to 15 kva with frequencies up to 2400 cycles. This equipment makes possible the reduction or elimination of iron in magnetic components, and maintenance is minimized because there are no commutators, brushes or springs in either the alternator or electric power drives.

9—SILICONE FINISH RESISTS HEAT

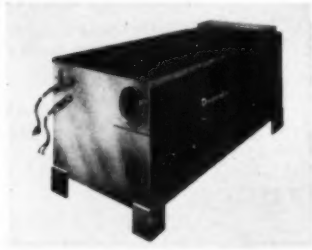
A heat-resistant finish—Sicon—formulated from a silicone base, has in recent months scored remarkable successes for many large companies in various lines of business, according to the manufacturer, Midland Industrial Finishes Co. Formerly marketed under the trade name of "Mico", it became widely known as the original silicone base finish. The product has been improved and refined and is claimed to ex-



hibit unusual stability at temperatures of as high as 1000 F. It has reportedly been thoroughly proved on the production line for such products as industrial furnaces, heating units, incinerators and similiar products. Protects and preserves surfaces of a wide variety of products where ordinary heat-resistant finishes fail, such as mufflers, exhaust stacks, engine boilers, electrical equipment and high-temperature processing equipment. Heat-resistant properties are gained from silicones that possess extreme resistance to heat, moisture, oxidation and ultra-violet rays. Available in easy-to-apply form—by brush, spray or dip.

10—ADSORPTION UNIT REDUCES MOISTURE

Manufacture of a new adsorption-type package unit for year-round humidity control and protection against rust, mold, mildew and corrosion in industrial applications has been announced by Dryomatic Corp. The unit, catalogued as Model 100, brings portable moisture control within the budget and space requirements of industries and businesses that annually lose millions of dollars because of moisture damage. The unit can give precise humidity control in a wide range of temperatures—from minus 40 F to plus 100 F, making it ideal for maintaining low humidity levels in cold-storage plants and unheated warehouses for

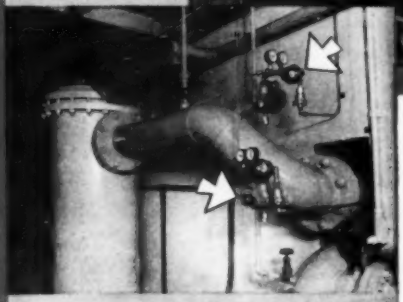


(Continued on page 16)

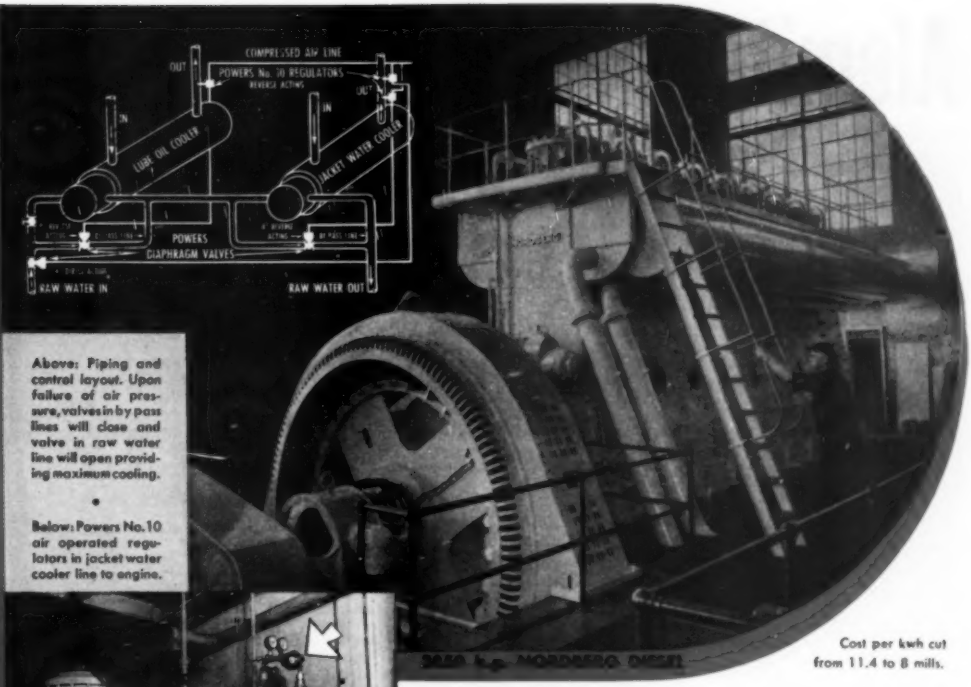
Above: Piping and control layout. Upon failure of air pressure, valves in by pass lines will close and valve in raw water line will open providing maximum cooling.

•

Below: Powers No. 10 air operated regulators in jacket water cooler line to engine.



Below: Powers pneumatically controlled valves



Cost per kwh cut from 11.4 to 8 mills.

POWERS Pneumatic Temperature Controls Help Freeport, N. Y. Light and Power Plant Reduce Costs and Increase Efficiency

With a total capacity of 17,310 h.p., Freeport, N. Y. has one of the largest municipally owned diesel-electric plants in the United States. Knowing the importance of accurate regulation of jacket water and lube oil temperatures, Chief Engineer Thomas Moore selected Powers compressed air operated controls for the Nordberg Diesel shown above, which has reduced cost per kwh 30%.

Greater Safety and Reliability of Powers pneumatic control assures correct jacket water and lube oil temperature regardless of load or seasonal changes. Accurate temperature control—improves lubrication, cylinder liner wear and reduces piston ring replacements; minimizes danger of piston seizure and sludging, reduces fuel and lube oil consumption. Cost? . . . about the same as a set of new piston rings.

With both pneumatic and self-operated regulators we may be able to help you select the type that will give better temperature control. Fill out coupon below. There's no obligation.

THE POWERS REGULATOR CO. *Established 1891. Offices in Over 50 Cities, See Your Phone Directory*

MAIL TO

(D-10)

The Powers Regulator Co., 2777 Greenview Ave., Chicago 14, Illinois

Have engineer call to study our requirements for better jacket water temperature control.

Name of Engine or Compressor ..... HP .....

Your Name .....

Address .....

City ..... State .....

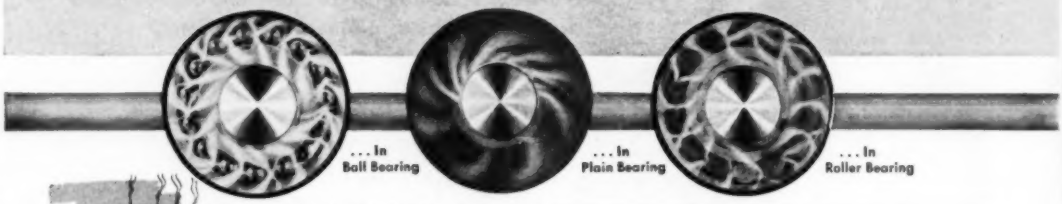
Alemite Announces THE MOST AMAZING

ALEMITE OIL-MIST

AUTOMATIC LUBRICATION SYSTEM

Unbelievably simple system atomizes oil into mist, circulates it through tubing to bearings. Bathes all bearing surfaces with fresh, clean, cool oil film. Uniformly maintains oil film on all sliding, rubbing, rolling parts regardless of variations in load, temperature or speed! No "peaks and valleys" of lubrication.

Fully automatic—eliminates waste and the uncertainties of the "human element." Extends bearing life as much as 17½ times. Seals bearings against dirt and abrasives. Cuts oil consumption as much as 90%. Greatly reduces the number of oils needed.



Here is lubricating progress so major—so far-reaching—as to command the interest of *every* executive concerned with industrial lubrication practices and costs.

You'll marvel that a system so simple—without any moving parts—can bring such a revolutionary change in the lubrication of machinery.

The Alemite Oil-Mist System requires only two simple settings—to control the amount of air pressure, and to regulate the density of the Oil-Mist. Once set, they require no further attention.

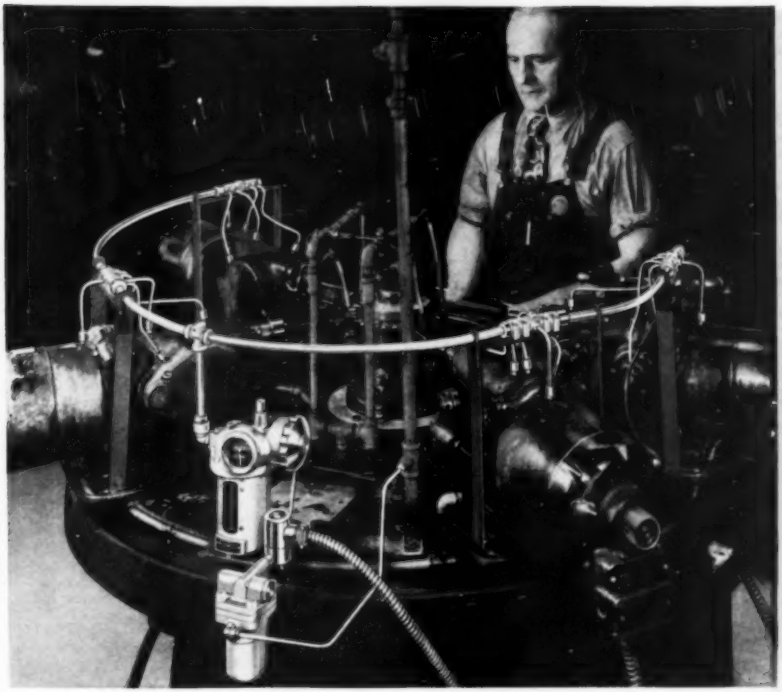
This great new Alemite Oil-Mist System has been proved by plant installations on a wide variety of machines in many industries including steel, coal, food processing, chemicals, metalworking, textiles and woodworking. The results are spectacular—in reduced lubrication costs, reduced maintenance costs, reduced service, reduced "down-time."

Desk-Top Demonstration,

No Obligation—Mail Coupon at Right

The handy coupon attached to your Company letterhead will bring a trained Alemite Lubrication Representative to your office. In a brief yet thorough Desk-Top Demonstration he will answer questions and tell you how Alemite Oil-Mist can provide more efficient lubrication at lower cost than you ever thought possible. Clip and mail the coupon today—to Alemite, Division of Stewart-Warner, 1850 Diversey Parkway, Chicago, Ill.

AUTOMATIC LUBRICATION SYSTEM EVER INVENTED



Here is an example of the many kinds of mechanical motions that can be lubricated by an Alemite Oil-Mist System, *using one oil.* On this automatic drilling machine Alemite Oil-Mist is lubricating 20 points, including cam, quill, worm and gear, reduction gear, gear and rack, gear train, plain and ball bearings. With Alemite Oil-Mist, this machine consumes only 10 oz. of oil during an 80-hour work week. System draws less than ONE cu. ft. of air per minute at 10 psi.

← OIL MIST ← OIL MIST

8 Advantages of the Alemite Oil-Mist System

1. Continuous Lubrication

Constantly deposits a fresh, clean film of oil on all surfaces of all bearings in the system.

2. Fully Automatic Lubrication

Eliminates the uncertainties of the "human element." (Refilling the reservoir is the only periodic service required.)

3. Elimination of Guesswork

Every bearing picks up only as much Oil-Mist as it needs. No bearing can be overlooked. None gets over-lubricated.

4. Reduction of Bearing Temperatures

Oil-Mist acts as bearing coolant, can lower bearing temperatures as much as 20°F.

5. Reduction of Types of Oil

Oil-Mist greatly reduces the number of oils that must be stocked, handled, and applied.

6. Elimination of "Down-Time"

All bearings in the system are constantly lubricated while the machine continues to produce.

7. Extension of Bearing Life

Oil-Mist multiplies the life of bearings many times. The life of grinding machine bearings has been extended from 400 to 7,000 hours.

8. Consumption of Oil Cut 90%

The Oil-Mist System usually consumes approximately 1/10 the amount consumed by any other oiling method.

Alemite OIL-MIST Lubrication

Another Product of STEWART WARNER

Mail this coupon today!

Alemite, Division of Stewart-Warner, Dept. M-41
1850 Diversey Parkway, Chicago 14, Ill.

☐ Please have your Alemite Lubrication Representative arrange a desk-top demonstration of Oil-Mist. This entails no cost or obligation on my part.

☐ Please send me information about Oil-Mist by mail.

My name _____

Position _____

Company (leave blank if letterhead attached) _____

(Continued from page 12)

year-round "dry-cold" protection. Relative humidities as low as 15 per cent can be maintained. Measuring 45 in. long, 19 high and 16 wide, it is compact and can be used either inside or outside the area to be protected, thus saving valuable floor space. The unit operates on 110-v, 60-cycle, single-phase with a maximum power consumption of 1.2 kw.

11—SOLENOID SHUT-OFF VALVE MADE OF BRONZE

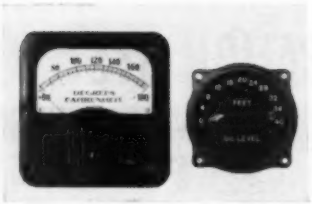
A corrosion resistant solenoid operated shut-off valve manufactured for instant control of all types of fluid-pressure operated equipment and machine process applications has been designed and manufactured by Airmatic Valve, Inc. Called the LDS-2-750 direct solenoid two-way capacity shut-off valve, it features positive seal, ports in line and only one moving part. Constructed of cast naval bronze, it is corrosion resistant throughout. Pressures range from 0 to 225 psi and operation is either a-c or

d-c. Use of levers, pilot and other forms of indirect application have been eliminated, and the design reduces the possibility of foreign matter accumulating on the valve seat. Employed for control of such fluids as oil, water or air. Inspection and servicing after original installation can be made without disturbing the piping. Compact design permits use in restricted space. The valve is now normally furnished in ¼ through 2 in. standard pipe sizes.

For more information use one of the convenient reply cards on page 101. numbers of items about which you want No postage necessary. Insert the key additional information mailed to you.

12—RESISTANCE THERMOMETER TO AID OIL INDUSTRY

Resistance thermometer, model 918, designed primarily for determining the average temperature of oil, petroleum, chemicals and other liquids in land storage tanks, has been introduced by Weston Electrical Instrument Corp. The device consists of a flexible resistance bulb assembly, a meter and an oil level selector. The meter and selector are enclosed in a housing for protection while the bulb assembly is placed permanently inside a tank. Any scale can be furnished with a total span of not less than 100 deg. For use with non-heated stocks,



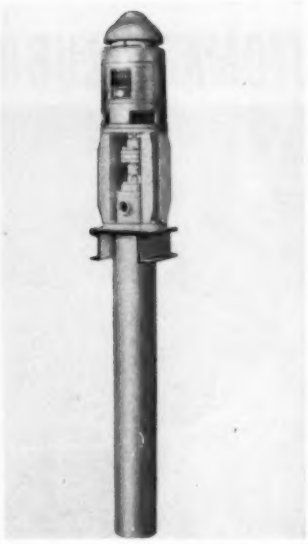
there is a scale range of 0 to 120 F; for heated products, the scale range is 60 to 180 F. Accuracy of the instrument is within plus or minus 0.5 per cent of the scale range. The assembly operates on 6-v d-c, that may be supplied by dry cells, or from a 115-v a-c circuit by equipping the meter with a transformer and rectifier.

13—SHELVING MADE OF STEEL AND WOOD

Lyon Metal Products, Inc. is manufacturing a complete line of adjustable steel-wood shelving in addition to its regular line of steel shelving for uses in all kinds of shops, stockrooms, assembly lines, industrial plants and institutional buildings. This adjustable steel-wood shelving presents that clean pleasing appearance combined with the features of strength and safety that is similarly found in steel shelving. Steel uprights support the hard wood shelving to the steel uprights. A pressed steel clip attaches each shelf to the steel upright giving the maximum in adjustability and strength. Available in dimensions of 3 ft wide, 1 or 1½ ft in depth, and 7 ft in height. Installation is simple because of the minimum number of parts to be handled. The only tools required to set up an installation is a hammer and a screw driver.

14—PUMP ADAPTABLE FOR PETROLEUM

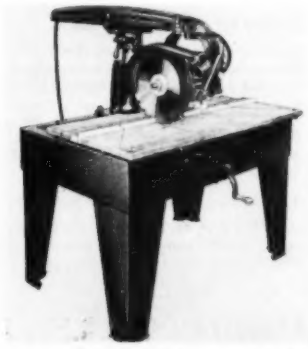
Byron Jackson Co. type VLT pump has been designed and developed for general industrial applications and is especially well suited for handling butane, propane, gasoline and other petroleum products. The unit is a small, strictly standard, vertical pump, furnished with pipe tap suction and discharge nozzles, mechanical seal and standard materials. It is built in one barrel size in which either an open or closed impeller



bowl assembly can be installed. By omitting the barrel, the unit is ideal for sump or tank pump service. The barrel is constructed of 6 in. standard pipe, flanged at the top for connection to the nozzle head. A motor flange is provided to receive solid shaft motors from 1½ to 10 hp inclusive at 3550 rpm. An adjustable flanged type coupling is supplied to permit easy and accurate lateral adjustment of impellers. The VLT pump has a maximum working pressure of 350 psi, with a pumping temperature of 250 F and a capacity of 100 gpm.

15—CUTTING MACHINE HAS LOW DEAD-RISE MOTOR

DeWalt, Inc., manufacturer of cutting machines for the woodworking, metal and plastics industries, is introducing a new radial-arm saw with a receding arm. The low dead-rise motor permits a depth of cut that is about 40 per cent greater than that possible with conventionally designed direct-drive motors. The reduced interference permits the arbor to be brought closer to the material being cut. A-c motors of this model are totally enclosed to prevent explosions, and Universal motors feature a



(Continued on page 20)

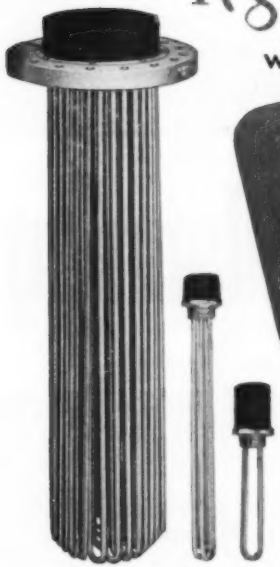
HEAT GASES AND LIQUIDS

Efficiently and Economically

"*Right on the Job!*"

with

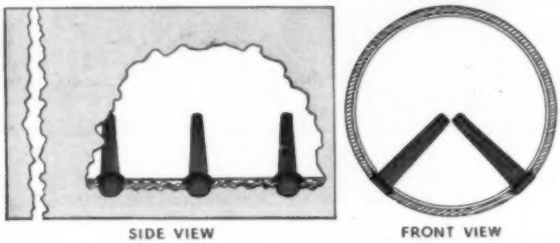
CHROMALOX *Electric* **IMMERSION HEATERS**



TMO Type Immersion Heaters are made in sizes up to 75 KW to operate in temperatures up to 900° F. and pressures up to 600 pounds.

CHROMALOX Tubular Immersion Heaters are used for heating compressed air and other gases: for super-heating steam; for heating liquids and Dowtherm, Prestone and similar heat-transfer mediums. They can be readily applied to high-temperature and high-pressure operations.

CHROMALOX Electric Immersion Heaters give you the *exact* temperatures you require and maintain these temperatures accurately. Dependable performance, economical operation, reduced spoilage are among other advantages gained by using these easy-to-install heaters.



SIDE VIEW FRONT VIEW

GIANT STEAM ACCUMULATOR USING CHROMALOX IMMERSION HEATERS (SIMPLIFIED VIEW)

Twenty-four TMO Heaters of 24 KW each are used in this steam accumulator (approximately 72 feet long, 8 feet diameter) to maintain 300° F steam temperature.

This installation was worked out on the job by Chromalox Application Engineers who are always ready to help solve your heating problems.

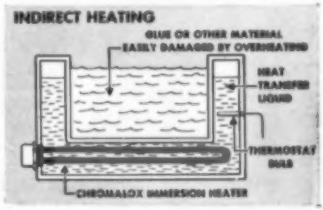
CHROMALOX

Electric Heat for Modern Industry

EDWIN L. WIEGAND CO. • 7529 Thomas Boulevard • Pittsburgh 8, Pa.

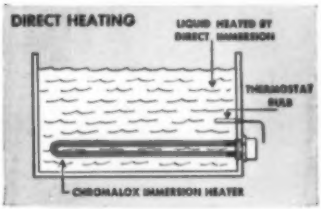
Typical Examples

of a few of the many uses for Chromalox Immersion Heaters



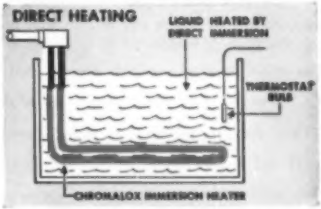
WATER OR OIL JACKETED KETTLES

Heaters are quickly and easily mounted in kettle wall; temperatures are accurately maintained manually or by automatic control. Uniform heat transfer makes this application particularly good for liquids that must be heated slowly to prevent damage by overheating.



HEATER MOUNTED PERMANENTLY IN TANK

Chromalox Immersion Heaters are welded or bolted through tank wall. Heaters are sheathed in copper, steel or alloy—as required to defeat corrosion. Temperatures are controlled thermostatically. Heat is absorbed directly and efficiently.



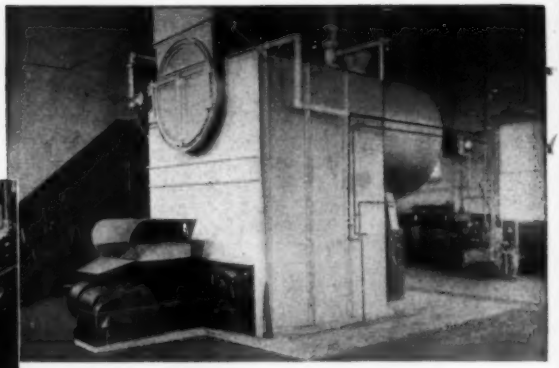
FOR HEAVY-DUTY IMMERSION HEATING

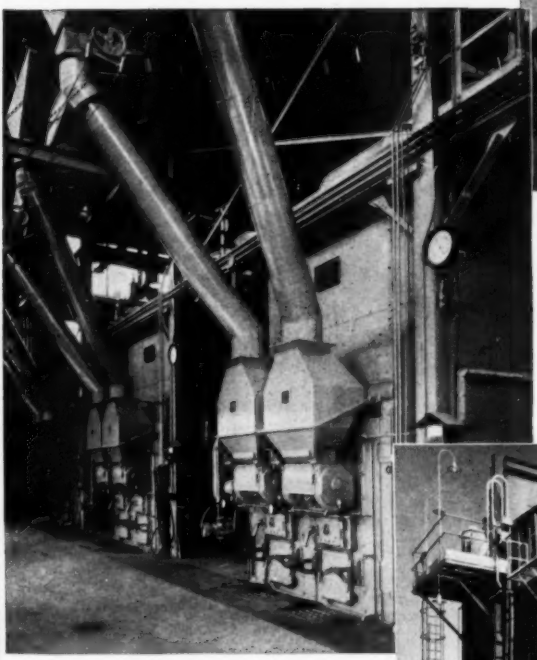
Low-density Immersion Heaters are especially designed for high-temperature melting-pots or salt baths. Heaters have legs to raise elements above sludge accumulation. They are quickly installed and easily removed for maintenance.

Want more Examples?

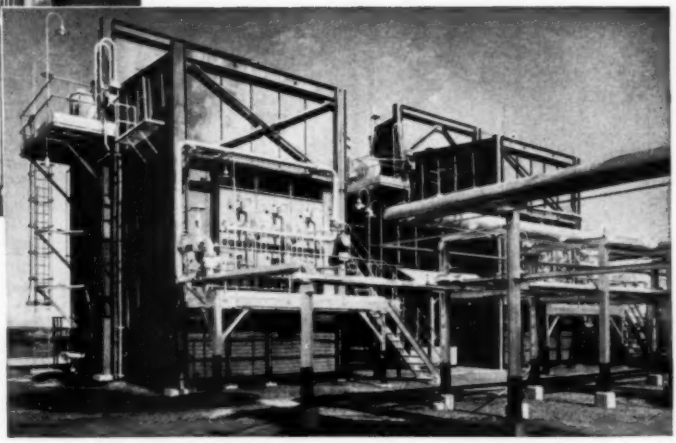
Request the fully-illustrated booklet "100 Ways to Apply Electric Heat." It contains photographs and drawings showing Chromalox Electric Heaters at work in plants throughout the United States. Write today for your copy.

IC-41





Planning



Installation for medium and smaller plants . . . pressure to 475 psi . . . capacity to 60,000 lbs. of steam per hr . . . suitable for any type of fuel.

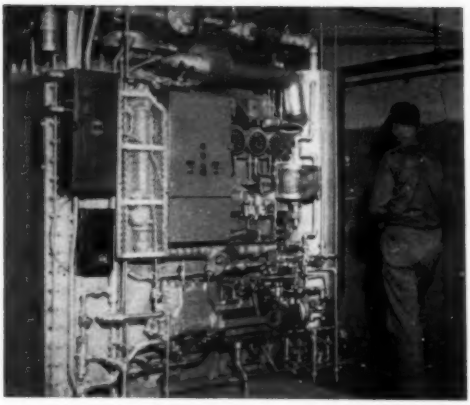
Installation for larger plants . . . pressure to 1000 psi . . . temperature to 900 F . . . capacity to 350,000 lbs. per hr . . . any fuel or type of firing . . . indoor or outdoor type construction.

COMBUSTION ENGINEERING

A MERGER OF COMBUSTION ENGINEERING COMPANY, INC. AND THE SUPERHEATER COMPANY

Installation for small plants . . . pressure up to 150 psi . . . capacity to 12,000 lbs. of steam per hr . . . adaptable to any fuel.

to buy BOILERS . . . this year?



Installation for special conditions including very limited space . . . quick steaming (full capacity in 3 min.) . . . fully automatic operation . . . capacity to 6000 lbs. of steam per hr . . . pressure to 300 psi. Ideal for intermittent load.

Sometime this year, or perhaps next, your company may decide to buy new boilers . . . to replace obsolete units . . . to meet increasing steam demands . . . or for a new plant. Whatever the time or circumstances, here's something it will pay you to remember. With fuel and operating costs firmly established at new high levels, today more than ever before, the first cost of a new boiler is decidedly secondary to the annual operating cost. In fact, the annual cost of fuel alone for the average boiler installation nowadays usually equals or exceeds the purchase price. And the normal life of a boiler should be 20 to 30 years, or longer.

Obviously, then, the operating economies accruing from better design, construction or application, will quickly offset the difference between the cheapest boiler you can buy and the best the market affords. Here is one case where the old adage "the best is the cheapest" really applies.

In addition to having installed thousands of industrial boilers . . . in every size category from less than 100 horsepower up . . . Combustion has designed and built many of the country's largest utility power station boilers. And it is in this field — the manufacturing of power on a large scale — that boiler design and construction are evaluated most critically and exhaustively.

The fact that C-E Boilers have been selected to meet the exacting performance standards of so many of the nation's largest utility power stations is evidence of the quality of design and construction you can expect to find in any boiler, large or small, that bears the Combustion nameplate.

Our recommendations as to the most suitable type of boiler and firing equipment for the *specific requirements* of your next installation are available to you and your consultants without obligation.

B-383A

— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

(Continued from page 16)

protected enclosure. The arm of the saw rides smoothly on eight grease-packed, double-row bearings. Locating latches permit the rapid positioning of the cutting tool in the many cutting positions possible. Thermal overload and manual push button starting switch are standard equipment. The machine is available in 3 and 5 hp sizes. Recommended saw blade sizes are: 12 in. for the smaller models and 14 in. for the larger models.

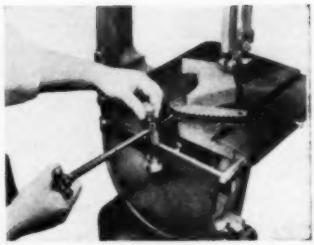
16—PIPE INSULATION IN VARIOUS SIZES

With the recent addition of curved block, Kaylo heat insulation is now available in the most complete range of sizes and thicknesses of any line of high temperature insulation on the market, according to Owens-Illinois Glass Co. The range covers tubes and pipes from ¼ to 72 in. dia and vessels up to 60 ft. Made of hydrous calcium silicate, which insulates effectively up to 1200 F, it comes in all standard sizes of block and in thicknesses from 1 to 6 in. for flat surface insulation. Pre-formed pipe covering sections are made for all standard tube or pipe diameters from ¼ to 12 in., tri-segmental form for pipes and tubes up to 23 in., quad-segmental for pipes and tubes up to 41 in. and K-segmental for pipes and tubes up to 72 in. Several characteristics reduce installation costs — extreme light

weight makes it easy to handle, breakage is minimized, large sizes are possible with fewer pieces needed to cover a given area and its insolubility cuts water damage.

19—ATTACHMENT PROVIDED FOR METAL BAND SAW

As an added convenience for use with the Delta 14 in. metal cutting band saw, the Delta Power Tool Div., Rockwell Mfg. Co. provides a screw-feed attachment. Special features of this device are fingertip feed screw release for quick adjustment, a star

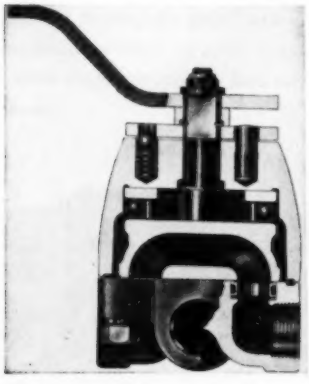


wheel to provide efficient feed action with little effort, an adjustable jaw usable in many positions for handling irregular shaped work and a laterally adjustable pivot block. The entire screw assembly can be removed instantly to provide complete table clearance for handling larger work. A complete instruction sheet comes with each unit showing how to cut rectangular pieces, curves and irregular shapes.

In the March issue of INDUSTRY AND POWER the illustrations for the releases of Barksdale Valves, Item 21, and Mulconroy Co., Item 46, were interchanged. To assist our readers in completely identifying each item with the proper illustration, we are republishing both with new numbers. Please refer to April issue when requesting information on these items.

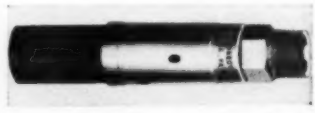
17—VALVE DESIGNED FOR EXTREME PRESSURES

The patented sealing principle employed in Barksdale Valves was specifically developed for extreme pressure control. It is a pressure balanced, self-aligning, tubular valve seat that keeps perfect intimate contact with the mating surface of an optically flat porting disc. The rotary movement of this disc (or rotor) opens and closes the flow passages. During the absence of fluid pressure a heavy marcel springwasher maintains the contact between sealing surfaces, while a predetermined hydraulic force acts on the seal under extreme pressure. Fluid flow is always through the center hole, never across sealing surfaces. This is an important characteristic particularly in the control of dirty high velocity fluids, because it eliminates the problem of scoring and wire drawing. Production models cover a complete range of the following types and pressures: shut-off valves from ¼ to 1½ in. for pressures 0 to 6000 psi, 4-way dual pressure valves in two classes, (1) for 3000 psi maximum pressure, (2) for 6000 psi maximum pressure and manipulator valves from ⅜ to 1 in. for pressures 0 to 1500 psi. The service ratings include all common industrial media such as water, air, hydraulic oil, gas, fuel and petroleum.



18—HOSE COUPLING HAS PRESS-LOCK

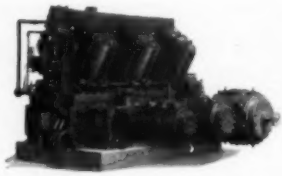
Through employment of an entirely new hose-to-coupling anchoring principle, the coupling manufactured by Mulconroy Co., assures greater strength, safety and efficiency. The hose provides a major portion of the coupling's tremendous holding power through application of the principle that rubber in mass form, while not compressible, can be displaced under pressure. Coupling consists of three parts: (1) corrugated stem with wide hex section, male iron pipe thread (or special thread) and collar to engage sleeve, (2) sleeve extending full length of stem, with forward end shaped inward to engage stem collar, and other end



flared to assist flexing of hose and (3) locking ring between collar and anchoring flange of sleeve. Made of steel, in sizes to fit hose from 3/16 to 2 in. and available in connection with Mulconroy hydraulic hose assemblies, or attached at factory to customer's hose.

20—COMPRESSOR IS GAS ENGINE DRIVEN

Ingersoll-Rand Co. has announced an improved design of its well-known XVG, a gas-engine-driven compressor design. This model, SVG, retains all of those features that have been so successful in the earlier units and adds the advantages secured by new materials, modern rotative speeds, and most modern manufacturing methods. It is built in two sizes, 330 hp with six cylinders and 440 hp with eight cylinders. Both sizes weigh about 20 per cent less per bhp than the XVG with no sacrifice in dependability. Foundations are even smaller due to the better balance. Crank angles of 120 deg on



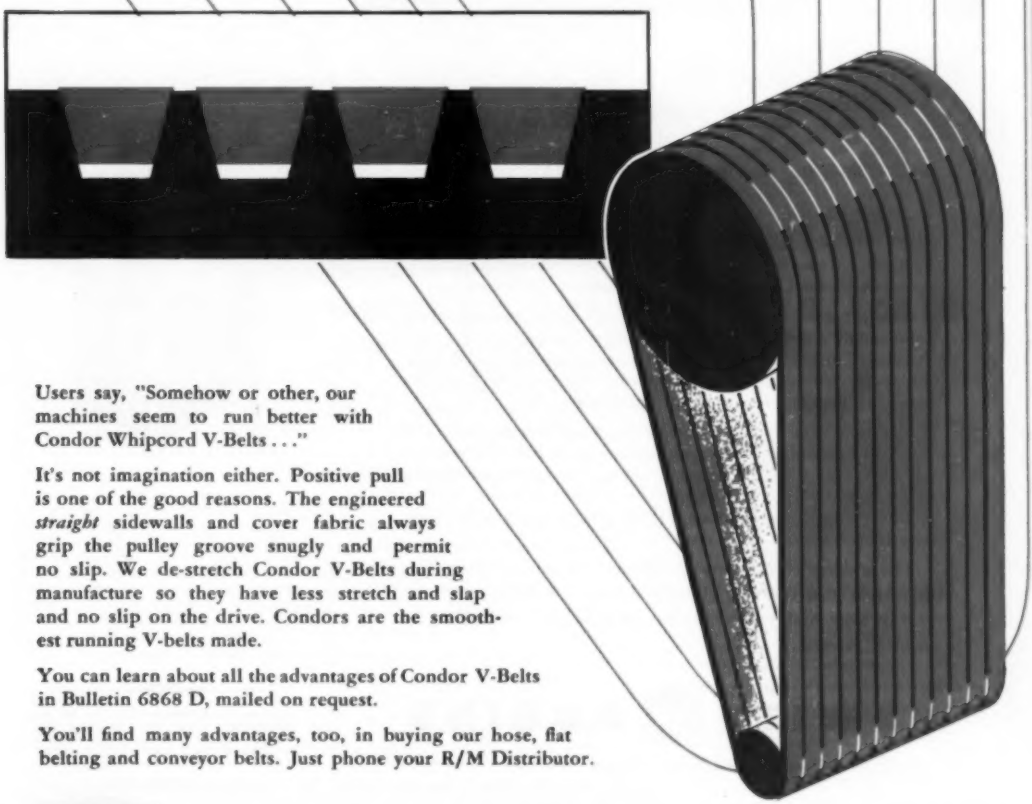
the 6-cylinder unit and 90 deg on the 8-cylinder unit, two power cylinders per compressor frame, lightweight aluminum power pistons with low inertia forces, and shaft counterweighting make the SVG a smoother running machine.

For more information use one of the convenient reply cards on page 101. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

21—INTERCHANGEABLE HUBS PROVIDE FLEXIBILITY

A major advancement in flexibility of hubs for raintight devices has been announced by the Square D Co. Interchangeable hubs on raintight circuit breakers, multi-breakers, switches and fusible entrance equipment greatly simplify the stocking of raintight equipment. Immediate delivery of the required hub size is now possible from electrical distributors' shelves. The galvannealed outdoor device has an extruded top, which is threaded for the die-cast interchangeable hub. The correct size of hub for the conduit is selected and screwed into

Condor V-BELTS GRIP THE GROOVES



Users say, "Somehow or other, our machines seem to run better with Condor Whipcord V-Belts . . ."

It's not imagination either. Positive pull is one of the good reasons. The engineered *straight* sidewalls and cover fabric always grip the pulley groove snugly and permit no slip. We de-stretch Condor V-Belts during manufacture so they have less stretch and slap and no slip on the drive. Condors are the smoothest running V-belts made.

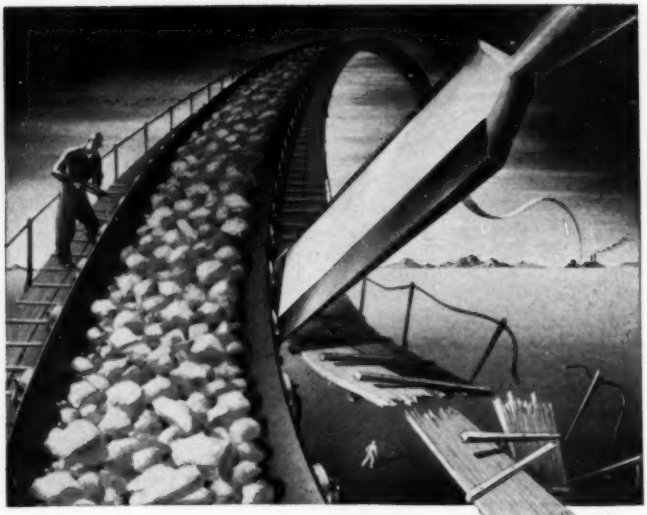
You can learn about all the advantages of Condor V-Belts in Bulletin 6868 D, mailed on request.

You'll find many advantages, too, in buying our hose, flat belting and conveyor belts. Just phone your R/M Distributor.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls



HOW TO ADD BY SUBTRACTING

SUBTRACT . . . that second walkway. Its sole purpose is to permit lubrication . . . and Hewitt-Robins Idlers are lubricated from one side only. You need but one walkway with a Hewitt-Robins Belt Conveyor.

ADD . . . the dollars you save in initial investment plus the man-hours saved by cutting the lubrication job in half.

You get more . . . and save more . . . when you turn your solid and fluid bulk materials handling problems over to Hewitt-Robins. You get the advantage of longest experience and most advanced design . . . Hewitt-Robins is "famous for firsts" in materials handling methods and machinery.

You save trouble. Hewitt-Robins is the only organization in the world producing, within one corporate structure, the complete belt conveyor package: engineering, specialized machinery *and belting*. Only Hewitt-Robins can accept undivided responsibility for all the elements of a belt conveyor system because *only Hewitt-Robins makes them all*.

The services of our three industrial divisions are yours, individually or collectively, according to your needs.

Next time materials handling is your problem, we invite you to make it ours.

HEWITT HR ROBINS

Executive Offices: 370 Lexington Avenue, New York 17, N. Y.

HEWITT RUBBER DIVISION: Belting, hose and other industrial rubber products
ROBINS CONVEYORS DIVISION: Conveying, screening, sizing, processing and dewatering machinery
ROBINS ENGINEERS DIVISION: Designing and engineering of materials handling systems

Hewitt-Robins is participating in the management and financing of Kentucky Synthetic Rubber Corporation

the top endwall. Design assures an electrical bond and watertight joint. When no hub is required, a similar die-cast closing cap may be inserted that seals the opening.

22—RADIAL SAW HAS WIDE CUTTING RANGE

A radial-arm saw—model 40-B—has just been announced by the Delta Power Tool Div., Rockwell Mfg. Co. that has the full capacity to make cuts at any angle from 0 to 90 deg, right and left, above the working table. The 360-deg radial action permits adjusting the saw to the lumber, instead of the lumber to the saw. Features

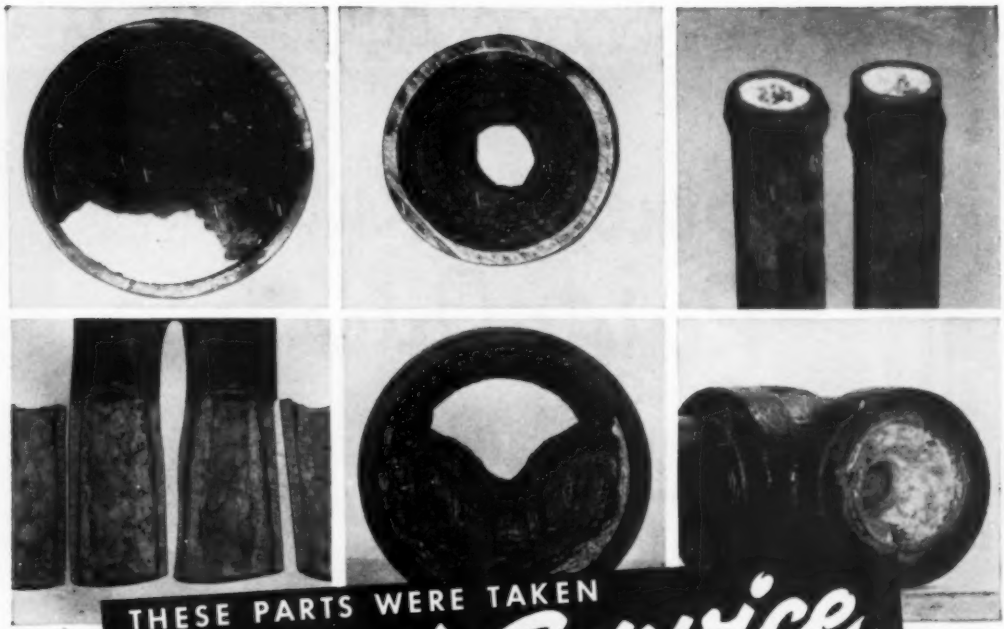
of the model 40-B include: automatic locating latches at 0, 30, 45, 60 and 90 deg; totally-enclosed, fiberglas-insulated direct-drive motor; lifetime nitralloy trackways; pivot-point slide that keeps saw kerf above work top; and a safety guard that has a splitter with kick-back fingers. Available in 3 types: (1) portable, (2) mobile, and (3) stationary. Sizes: ½-5 hp, 1-phase a-c, and ¾-7 ½ hp, 3-phase a-c.

For more information use one of the convenient reply cards on page 101. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

23—MINIATURE DRIVE HAS LEVER CONTROL

The Metron Instrument Co. has made available a miniature variable-speed drive with lever type speed control. This small,

(Continued on page 112)



THESE PARTS WERE TAKEN

Out of Service

BECAUSE OF SCALE

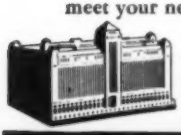
DEARBORN FORMULA 134 REMOVES SCALE

● These destroyed parts represent a large, unnecessary investment in equipment, labor and shut-down time. Conditions like these can easily and economically be avoided with Dearborn Formula 134. Wherever water travels—scale tends to form. Formula 134 is a concentrated solvent for the rapid removal of scale in heat exchange units, boilers, pumps, feed lines, meters, condensers and other valuable equipment.

Formula 134 is just one of many Dearborn formulas used to save equipment, reduce shut-down time and maintenance costs. Other Dearborn formulas control acidity of condensate, prevent excessive foaming and prevent corrosion of metal in contact with calcium and sodium chloride refrigerating brines. For the correct water treatment to best meet your needs—consult Dearborn.

SAFE, SIMPLE APPLICATION

with specially designed, inexpensive pump also supplied by Dearborn! Send for Bulletin 5002 which describes in detail methods for the removal of scale with Dearborn Formula 134.



AFTER APRIL 16, OUR NEW ADDRESS WILL BE:

DEARBORN CHEMICAL COMPANY

Merchandise Mart Plaza • Chicago 54, Illinois

DEARBORN CHEMICAL COMPANY
Merchandise Mart Plaza Dept. INP
Chicago 54, Illinois

Gentlemen:

Please send me information on Dearborn Formula 134.

Name.....

Company.....

Address.....

City.....State.....

Dearborn

TRADE MARK REGISTERED

THE LEADER IN WATER TREATMENT AND RUST PREVENTIVES

Sinclair Rubilene Resists Oxidation Gives Long, Low Cost Service

Oxidation attacks oil wherever there is continuous recirculation—in enclosed crankcase systems and, especially, in central circulating systems. It forms damaging acidic compounds, gum, carbon, and sludge. Result: frictional drag is increased, oil lines may become restricted or closed, wear accelerated, efficiency and life lowered.

Many years of experience show Sinclair Rubilene successfully withstands oxidation even under sustained high temperatures. This is due to Rubilene's greater stability and ruggedness. At the same time non-foaming Rubilene assures a solid flow of oil to provide a tough oil cushion between all moving parts. Rubilene thus lessens friction and wear and provides high efficiency and smooth operation.

Why not eliminate worry over damaging oxidation and assure reliable lubrication? Use Sinclair Rubilene Oils.

Your nearest Supplier of Sinclair Products will gladly arrange for lubrication counsel, or write to Sinclair Refining Company, 630 Fifth Avenue, New York 20, N. Y.

SINCLAIR

Sustained New-Oil Quality
Long Oil Life
Tough Oil– Less Wear
Circulates Freely
INDUSTRIAL OILS

new bulletins and catalogs

Be sure to order your free copy of these booklets—they're the latest information published by leading manufacturers. Use the postage-free order cards on Page 101. Just list the Key Numbers of the bulletins you want in the spaces provided on cards.

BOILERS, AUXILIARIES, ACCESSORIES

200—Unit Steam Generator. Design features of heavy-duty, self-contained, fully automatic, portable steam plant are described in 8-page bulletin. Contains data and dimensions in tabular form along with typical performance curves. The unit has a guaranteed thermal efficiency of 80% and permits fully automatic operation even with No. 6 oil. Recent development provides for either gas or oil firing, alone or in combination. Preferred Utilities Mfg. Corp.

201—Firebrick. Economic advantages, industrial applications, and refractory properties of insulating firebrick are presented in 4-page folder. Says product is the highest temperature insulating firebrick for exposed or back-up use. Physical and thermal characteristics are given in table form. Illustrations show application in construction of slot type forging furnace. Also contains summarized information on accessory materials. Johns-Manville.

202—Steam Generator. Complete, compact, standardized design, controlled re-circulation steam generator is thoroughly described in 6-page folder. Gives description, principal features, background, application, and list of users. Cutaway vertical section shows the arrangement of the heating surfaces. Gas fired and oil fired units are illustrated. Available in several sizes for capacities up to 6000 lb of steam per hr and for operating pressures up to 300 psi. Completely automatic operation. Combustion Engineering—Superheater, Inc.

203—Oil Burners. Up-to-date 6-page bulletin gives you all the details on Preferred's horizontal rotary heavy-oil burner. Dual pump reservoir, patented "Voluvalve" fuel regulator, high-speed belt drive and other engineering features are explained fully. Preferred Utilities Mfg. Corp.

204—Spreader Stoker. Bulletin describes spreader stoker having overthrow rotors that provides uniform fuel distribution. Available in various sizes with stationary, hand dumping and power dumping grates. Burns all grades of bituminous coal, lignite, and wood and other refuse. Detroit Stoker Co.

205—Oil Burner Products. Condensed 16-page catalog gives complete listing, with illustrations, of oil burner products including fully automatic horizontal rotary type, steam turbine driven type, combination gas-oil type, semi-automatic, and pressure atomizing types. Booklet also features selector chart, plus table of specifications and capacities and will prove helpful where additional installation knowledge is required before ordering equipment. Operation and control of each unit is described in detail. Ray Oil Burner Co.

206—Boilers & Stokers. The results of over 88 years experience are embodied in the design and construction of Scotch Marine type portable boilers says 28-page catalog. Explains the basic principles along with many new features which are said to account for high economy and efficiency. Advantages of this internally fired, return-tubular boiler are thoroughly discussed. Photographs and cross-sections illustrate various models ranging in capacities from 6 hp up to 250 hp. Specifications table for these boilers built to the ASME code is included. Details and features of underfeed stokers designed especially for this type boiler are contained in separate section. The James Leffel & Co.

207—Packaged Steam Generators. Over 110 years of boiler building experience stand behind this new conception of packaged water tube steam generator. Colorful 8-page folder shows all the details of the 2-drum, 3-pass Keystone. Dimensions and capacities for the 13 sizes (75 to 800 hp) are given in tabular and diagrammatic form. Cutaway views show design and construction features. Bulletin unfolds to make one page showing enlarged views of the boiler with all equipment identified. Erie City Iron Works.

208—Soot Blower. Proven by performance under severe conditions on marine boilers is this newcomer to the stationary field. Design features of rotary, soot blower head that assures better boiler cleaning, ease of operation, long and dependable service, and low maintenance are pictured and described in 4-page bulletin. Diagrams show how simple it is to service and maintain the unit. Vulcan Soot Blower Div., Continental Foundry & Machine Co.

209—Burners. Series CBM combination gas and oil burners provide approximately the same heat pattern when firing either or both fuels in combination says 4-page bulletin. Other features are described and diagrams show sectional views along with installation data. John Zink Co.

210—Pulverized Coal Firing. Of particular interest to design engineers and coal consumers is this 6-page house organ dealing with the advantages of pulverized coal firing. Design procedure, pulverizers, furnace, burners, accessories and operation are thoroughly discussed. Tables, curves and drawings are included. The Pittston Co.

PRIME MOVERS: DIESELS, TURBINES, COMPRESSORS

211—Diesel Engines. New line of four-cycle, direct-injection, totally enclosed engines is illustrated and described in 18-page bulletin. Photographs, cutaway line drawings and specifications are shown. Also described are supercharged engine, dual fuel and supercharged dual fuel diesel engines. Worthington Pump & Machinery Corp.

212—Diesel Engine. Construction and operation features of 4-cycle, one-cylinder and recently introduced 2-cylinder, vertical, mechanical injection diesel engine are contained in 6-page bulletin. Illustrates various applications including electric generating sets and pumping units; also, clutch or stub-shaft power take-off for direct connection or belt drive. Gives kw rating and pumping capacities of the different models. Pictures all main engine parts and gives their particular specifications. Nordberg Mfg. Co.

213—Turbo-Compressors. Centrifugal turbo-compressors which increase the air pressure in stages by means of lightweight impellers are the subject of 12-page bulletin. Construction and features are discussed. Multi-stage and single-stage machines are described and sketched. Overhung and outboard types are shown along with gas boosters, midget turbos, air filters and blast gates. Rating tables and performance curve offer data in capsule form. Two pages of application photos are included. The Spencer Turbine Co.

214—Turbine-Generators. Turbine-generators (500 kw and above) are covered in 40-page bulletin that pictures and describes nearly 50 installations, both utility and industrial. Brief discussions of generator and exciter cooling methods are included. Detailed drawing shows a typical turbine-condenser installation arrangement. Dimensions and weights of standard units are tabulated. Turbine Div. Elliott Co.

(Continued on page 30)

COPPUS "BLUE RIBBON" VENTILATORS

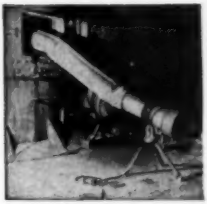
identified by the blue band

FOR WORKERS'

- *Safety*
- *Health*
- *Comfort*
- *Efficiency*

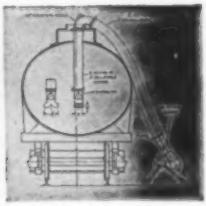
VANO Design "A" VENTILATOR

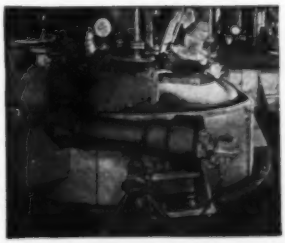
Vano Design "A" cooling interior of furnace, supplying fresh air through 10 feet of "Ventube" to provide safety and comfort during repair work.



Vano Design "A" delivering fresh air to cable manhole, expelling sewer gas, making entrance safe in a few minutes.

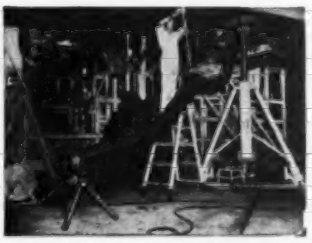
Vano Design "A" Ventilator plus a few accessories feeds large air volume into tank car, driving out fumes, stagnant or hot air for workers' safety and comfort.





Vano Design "A" supplying fresh air in Reactor Room of Synthetic Rubber Plant.

Vano Design "A" Ventilator supplying fresh air to men working in wing compartments, fuselages, etc.



Powered by a ½ hp motor, and equipped with the exclusive Coppus axial-flow propeller-type fan, this general-purpose blower delivers 1500 CFM of fresh air. It supplies ventilation for tanks, tank cars, drums, vats, underground cable manholes, pipe galleries, airplane wing compartments and fuselages, and other confined places. Weighs only 103 lbs. Has 8"-diameter flexible canvas tubing ("Ventube").

VANO DESIGN "C"

VENTILATOR-EXHAUSTER

Vano Design "C" equipped with 8" discharge tubing removing welding fumes.

Vano Design "C" equipped with two suction lines removing welding fumes for operators' safety.

For withdrawing welding fumes from confined places or directly from the welding rod ...or for expelling fumes or hot air from enclosed vessels. You can get it with 8" suction inlet for 8" non-collapsible tubing ...or with multiple inlet nozzles for 5", 4" or 3" suction hose. The discharge outlet takes 8" "Ventube". Powered by a ½ hp motor, it weighs only 85 lbs.

COPPUS ENGINEERING CORP., 134 PARK AVENUE, WORCESTER 2, MASS.
Please send information on the Blowers that clear the air for Action.

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fuselages, wings, etc.
- ☐ on cake ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.
- COOLING:
- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.

NAME.....

COMPANY.....

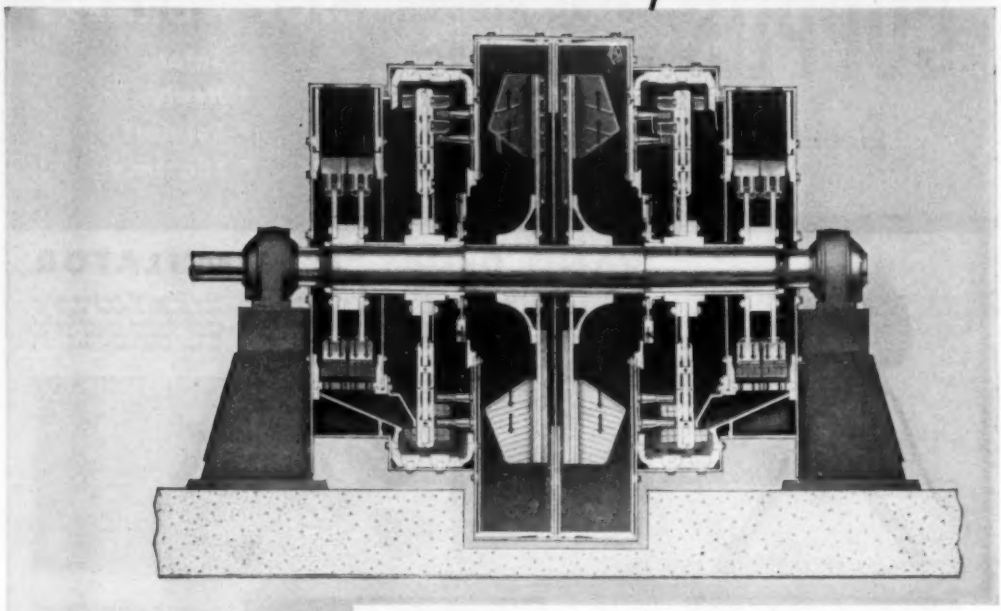
ADDRESS.....

CITY.....

(Write here any special ventilating problem you may have.)

COPPUS "BLUE RIBBON" PRODUCTS — *Designed for Your Industry, Engineered for You*

The NEW "50" Series Riley Pulverizer

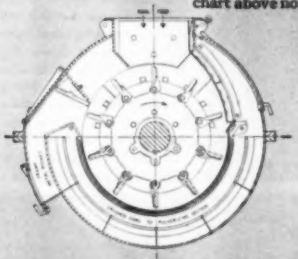


Pulverizing parts faced with Tungsten Carbide

Long periods continuous operation
Low maintenance . . . Sustained fineness

Development of the use of tungsten carbide faced pulverizer parts was started by Riley over ten years ago. Hundreds of existing Riley pulverizers have been equipped. The use of tungsten carbide adds tremendously to the life of the parts. While Riley pulverizers have been in operation for over two years and have pulverized in excess of 50,000 tons of coal, wear of the tungsten carbide is scarcely measurable. These parts are good for many more years of service.

The use of tungsten carbide not only assures long continuous periods of operation without maintenance shutdowns, but because of the extremely long life, greatly reduces maintenance cost per ton of coal pulverized. Fineness of pulverization is sustained without any adjustments whatsoever. You will note from the chart above no reduction in fineness though practically 50,000 tons of coal have been pulverized.



Preliminary Crusher-Dryer Section

No capacity reduction with high moisture coals
Complete reliability

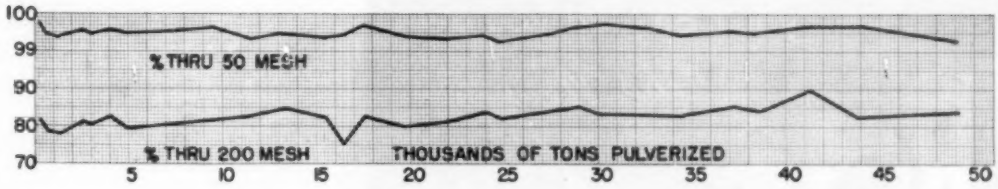
Provided air or furnace gas of sufficient temperature is supplied, there is no capacity reduction with increased moisture content of the coal. The crusher section acts as a flash dryer. In this section coal is crushed to a fine granular state, approximately 40% through a 50-mesh screen, representing about 5% of the work to be done. Coal enters the pulverizing section where 95% of the work is done, with free moisture evaporated from the coal, consequently moisture content of the coal entering the crusher section has no effect on pulverizer capacity.

The crusher section of the pulverizer rejects tramp iron, iron pyrites and other hard foreign substance in the coal, preventing any materials from entering the pulverizer section which could cause damage.

RILEY STOKER CORPORATION
WORCESTER, MASS.

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

a most significant Pulverizer Development



Other Operating Advantages

in addition to long life, low maintenance, sustained fineness of pulverization . . . no capacity reduction with high moisture coals and complete reliability

Here is what one user has to say about his Riley pulverizers after equipping them with tungsten carbide parts:

Pleased to advise that in my opinion Riley Mills with carbide elements will outperform any mill today. Original parts installed Sept. 1948 are still going strong and fineness does not go below 80% through 200 mesh. Fully expect mill maintenance cost will run less than three cents per ton.

Flexibility—Wide Load Range

As change in coal feed gives instantaneous corresponding change in pulverized coal output—there is no lag—rapidly and widely fluctuating loads are efficiently and easily carried.

Ability to Carry Low Loads

With the combination of Riley pulverizers and burners, extremely low loads with stable ignition can be maintained. It is not unusual for load ranges of 10 to 1 or for loads under 5000 pounds of steam per hour to be carried at Riley installations.

High Primary Air Temperatures

There is no necessity of limiting primary air temperatures as a precaution against fire or explosion or because of lubricating problems. Expensive control equipment limiting primary air temperatures is not required.

Ease of Lighting

Because of small percentage of primary air, a rich and readily lighted mixture of air and coal is obtained which together with the uniform distribution with Riley burners makes lighting easy and gives stable flame at low loads.

Quiet, Vibrationless Operation

There is no comparison between Riley pulverizers and other makes insofar as quiet vibrationless operation is concerned. You hear nothing more than a motor hum.

Small Space Required—Minimum Foundations

Riley pulverizers require less space per unit of capacity. Massive deep foundations are not required due to their vibrationless quiet operation.

Explosion Proof

There has never been an explosion in a Riley pulverizer. The velocity of coal travel through the pulverizer is faster than the rate of flame propagation, eliminating the possibility of an explosion.

These companies have recently ordered new "50" Series Riley Pulverizers

MONONGAHELA POWER COMPANY
Albright, W. Va.
IOWA-ILLINOIS GAS & ELECTRIC CO.
Davenport, Iowa
UTAH POWER & LIGHT CO.
Salt Lake City, Utah
SUPERIOR WATER, LIGHT & POWER CO.
Superior, Wisc.
WESTERN ELECTRIC CO.
Chicago, Ill.
CARNEGIE ILLINOIS STEEL CO.
Youngstown, Ohio
CELANESE CORP. OF AMERICA
Rock Hill, S. C.
PITTSBURGH PLATE GLASS CO.
New Martinsville, W. Va.
HOOKER ELECTROCHEMICAL CO.
Niagara Falls, N. Y.
U. S. FINISHING CO.
Norwich, Conn.
SYRACUSE UNIVERSITY
Syracuse, N. Y.
RIEGEL TEXTILE CORP.
Trion, Ga.
CITY OF AUSTIN
Austin, Minn.
CIBA STATES LTD.
Toms River, N. J.
BELL AIRCRAFT CORP.
Niagara Falls, N. Y.
POTOMAC LIGHT AND POWER CO.
Albright, West Va.
NORTHERN PAPER MILLS
Green Bay, Wisc.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in power costs

COMPLETE STEAM GENERATING UNITS

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

When choice materials are scarce

you'll be glad you own

The New

ROTOJET®

TUBE CLEANERS

Rotojet owners can expect little or no maintenance problems during the critical times ahead. Simple design has always been a basic feature of Rotojet Motors, which have only two moving parts. That is a very important advantage, especially when quality materials for replacement parts are in short supply.

Replacement parts have always been available for Rotojet Cleaners. During our 40 years of tube cleaner specialization, prompt, efficient service has earned us the good will of our thousands of customers. To help owners of old and new Rotojet equipment to get maximum service, we have prepared a folder showing various accessories which will prolong the life and improve the performance of tube cleaners. We invite you to write for a free copy.

SEND FOR NEW ROTOJET BULLETIN

THE SECRET

ROTOJET Motor has only two moving parts, a shaft and a paddle. Positive contact between paddle and Rotocentric (egg-shape) bore cylinder prevents stalling at low speeds. No leakage. Delivers maximum power for air used.

ELLIOTT COMPANY-ROTO DIVISION

156 Sussex Avenue Newark 1, N. J.

(Continued from page 26)

WATER AND LIQUID TREATMENT

215—Oil & Water Cooler. Helically finned heat-transfer elements provide lighter, more compact and less costly unit for cooling service says 20-page bulletin. Design details are described and illustrated. Complete selection data are given for various ranges of duties together with dimensions and specifications for standard sizes. The units are reported to be particularly adapted to services such as cooling diesel engine jacket water, lubricating oil, transformer oil, and quenching oil. The Griscom-Russell Co.

216—Cooling Towers. Distinctive feature of these industrial cooling towers is the packing bed of Berl Saddles, heretofore used primarily in scrubbing towers. Four-page bulletin describes how corrosion-resistant saddles permit reduction of tower heights and pumping hp. Technical data and a specimen cooling tower problem are given. Aqua-Therm, Inc.

217—Water Softeners. Detailed explanation of the sodium zeolite softening process is contained in new bulletin. Gives the data necessary for laying out zeolite water-softening plant, along with the factors governing sizing such equipment and selection of zeolite material. Included is complete description of the single control valve together with other details of design and construction. Pictures and diagrams illustrate the publication. Cochrane Corp.

218—Softener. Precipitating softener and coagulator, in which energy for floc preparation is mechanical, is thoroughly described in new bulletin. Flow charts illustrate a discussion of the flow circuit. Chemical feeders, dual purpose pump and chemical proportioning system are pictured and described. Worthington Pump & Machinery Corp.

219—Dry-Fan Cooling Towers. Mechanical draft cooling towers in a capacity range of 3 to 30 tons of refrigeration are illustrated and described in 4-page bulletin. Gives full information on construction features along with sectional views that illustrate the advantages. Selection table, performance data table, and dimensions table along with a series of step-by-step installation photographs are included. Binks Mfg. Co.

FILTERS, STRAINERS, CLARIFIERS, DEHYDRATORS

220—Dehydrator. For efficient drying of gases, air or liquids, Pritchard recommends its Hydryer. Five types are illustrated and described in 4-page bulletin. Discusses design and operation of standard and special types. Other products are briefly described. J. F. Pritchard & Co.

221—Water Filters. Self-cleaning filters designed to filter large volumes of water and other liquids rapidly and at low cost are the subject of 6-page bulletin. Discusses self-cleaning feature

which cuts actual cleaning time to approximately 6 min. Illustrations show several typical installations along with drawings of piping arrangements. Sparkler Mfg. Co.

222—Pipeline Filters. This 8-page bulletin describes, illustrates and gives applications and specifications for 75 pipeline filters for air and other gases. Principle that provides both mechanical separation and filtration is discussed along with features that permit the unit to function as both separator and filter. Installation views show a new filter built for air pressures up to 6000 psi. Also shown are vacuum and absorption types along with special models for removal of carbon black and aluminum oxide. Dollinger Corp.

223—Filter-Clarifier. Does your processing require a crystal-clear filtrate? 4-page bulletin gives you operating principles, typical performance data, capacities and advantages of filter-clarifier. Not a backwash type, but uses, instead a spiral scraper that takes a cut off the sand bed when the filter rate decreases. Hardinge Co., Inc.

224—Centrifuges. Almost all modern industrial processes have the problem of continuously and economically handling large quantities of slurries and suspensions. Here is a 12-page bulletin to help solve your problems. Explains operating principles and applications for two types of high speed horizontal centrifuges. Cutaway drawings as well as installation photos illustrate the booklet. The Sharples Corp.

ELECTRICAL EQUIPMENT

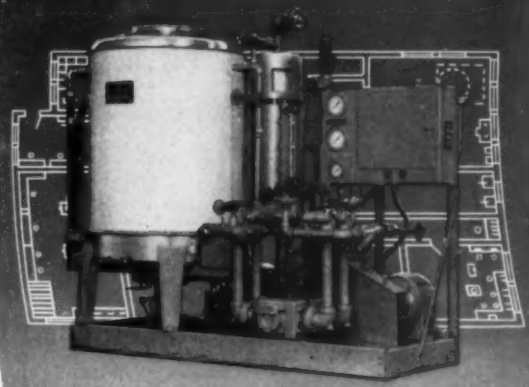
225—D-C Motors & Generators. 19-page booklet describing the Life-Line type SK d-c motors and generators shows how a new design uses rolled steel frames, heavy steel brackets and prelubricated double-sealed ball bearings to provide long life without outages. Also pictures and discusses unit construction of field coils for ease of replacement; use of Tufvar insulated conductors in the armature; unique construction of the end turns that prevents localized heating. Types, enclosures, and mountings for many applications are listed. Westinghouse Electric Corp.

226—Bushing Standardization. More than 1000 different types of G. E. transformer and circuit breaker bushings have been replaced with 38 standard bushings according to 12-page bulletin that announces a bushing standardization program. Tables show bushings, now in service, which can be replaced by the listed 38 standard bushings. Lower prices, faster delivery and smaller inventories on types rated from 15-kv to 230-kv inclusive, 1200 amp and below, are some of the advantages claimed. General Electric Co.

227—Solderless Connectors. UL-approved connectors for solderless splicing and terminating of electrical wires are tool and time savers claims 4-page bulletin. Contains detailed descriptive

(Continued on page 32)

MORE STEAM
Faster and at Less Cost



SPECIFY *Clayton*
FORCED RECIRCULATION
STEAM GENERATORS

Plan your steam plant for long range economy and realize immediate savings on installation and operating costs.

The Clayton *Forced Recirculation* Steam Generator...in sizes from 15 to 100 h.p., and equipped to burn gas or oil, or both...is a compact, self-contained steam plant ready to install and operate as it is delivered. No accessories to buy. No stack, bricking or foundations to install. Move into place; connect fuel and water lines, electricity and vent, and the Clayton generator is ready to operate. Occupies 30% to 70% less space than conventional boilers of same capacity.

Within 5 minutes from a cold start, the Clayton generator attains full operating pressure. Any fluctuating load demand within its rated capacity is instantly and automatically met. No standby losses. High thermal efficiency cuts fuel costs in half, or better. On gas fired units, new electronic safety control proves the flame pilot; automatically shuts down plant on ignition failure or loss of fire. Clayton generators are built to conform to the A.S.M.E. Boiler Code, and are Hartford inspected. Send the coupon for complete catalog.

The coupon below brings a convincing demonstration to your desk.

STEAM PLANT OPERATORS *Mail this coupon*

CLAYTON MANUFACTURING COMPANY IP-4
Box 550, EL MONTE, CALIFORNIA

Send name of nearest distributor and arrange desk demonstration of Clayton *Forced Recirculation* principle. Send catalog.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____

Animated flow chart shows how *Forced Recirculation* principle cuts steam costs.

CUT FUEL COSTS
this Quick Easy Way!
In plants the country over, simply replacing worn out, leaky traps is enabling operators to maintain full heat requirements on reduced amounts of fuel. For example: an internationally famous maker of farm implements, after installing Hoffman traps on radiators, recorded a drop of 33% in steam consumption for heating, with corresponding fuel savings. Hoffman Steam Traps make any heating plant modernization a genuine success. Not only are they recognized as highly efficient units, but they have features which amazingly prolong service life. They are so constructed that all parts subject to wear can be easily and inexpensively renewed—no need to junk an entire unit because of a worn seat. All together, these traps are a rare combination of sound design and excellent material, assembled with genuine pride in good workmanship. Your customers will welcome your suggestions for modernizing their heating plants.
Nos. 8H and 9H
HIGH PRESSURE
Pressure Range 0 to 125 lbs. Cap. from 235 to 1250 lbs. com. p.h. No. 8H in angle, R.H., L.H. and straightway patterns. No. 9H in angle pattern only.
Nos. 8 and 9
MEDIUM PRESSURE
Pressure Range 0 to 50 lbs. Cap. from 100 to 850 lbs. com. p.h. No. 8 in angle, R.H., L.H. and straightway patterns. No. 9 in angle pattern only.
No. 17C
LOW PRESSURE
Pressure Range 0 to 15 lbs. Cap. 200 sq. ft. E.D.R. Angle, swivel and vertical patterns.
Removable thermal units are a distinguishing feature of Hoffman Traps, greatly simplifying cleanout and inspection work.
HOFFMAN Steam TRAPS
HOFFMAN SPECIALTY COMPANY, Dept. IP-4, 1001 York St., Indianapolis 7, Ind.
FOR END OF MAIN
FOR UNIT HEATER

(Continued from page 31)

data, installation instructions and ordering information. Buchanan Electrical Products Corp.

INSTRUMENTS, CONTROLS, RECORDERS

228—Combustion Controls. Need for creating more steam with less fuel calls for proper instrumentation and control according to 12-page catalog. Latest information, description, specifications and illustrations of combustion instruments and controls are contained. In addition to line of electric damper controls and gages, the booklet describes new master regulator steam control. Cleveland Fuel Equipment Co.

229—Dyamometer Scales. Most any type of dyamometer scale for measuring tension and force may be found in 14-page bulletin that illustrates and describes the various models manufactured by this maker of precision springs. Features, applications, tolerance tables, capacities and dimensions are included as are diagrams and cutaway views showing the working parts. John Chatillon & Sons.

230—Instruments. Temperature and pressure instruments including industrial thermometers, accessories, recording thermometers, recording pressure gages, panel boards, air-operated temperature and pressure controllers, diaphragm motor valves, and pressure gages and regulators are listed and illustrated in 56-page catalog. Specifications along with general data on each unit are included. H. O. Trerice Co.

231—Feedwater Control. Straightforward, concise discussion of problems encountered in feedwater control and how to help solve them with air-operated, three-element system is contained in 16-page bulletin. Diagrams, cutaway views, typical chart records and photographs of modern installations are used to aid in describing the latest developments in the control system. Bailey Meter Co.

232—Liquid Level Gages. Float, pressure bulb, pressure counterpoise, differential pressure, and air-bubbler types of liquid level gages for a variety of uses are described in 24-page bulletin. Applications include the measurement and automatic control of water and other liquids, whether flowing, turbulent, corrosive, under static pressure, covered with ice, or carrying solid matter. Also contains information on remote recording and remote automatic pump control of water level. Photographs and drawings supplement the technical data. The Bristol Co.

MATERIAL HANDLING

233—Coal Handling. Modern central-station coal-handling practices as portrayed by recent installations are given in 20-page bulletin. Illustrates individual units of equipment along with diagrams, dimensional drawings, etc. The C. O. Bartlett & Snow Co.

234—Magnetic Protection. Unit de-

signed to remove tramp iron from materials conveyed in pneumatic, gravity flow, or liquid lines is pictured and described in 4-page bulletin. Included are construction and application data, information on the selection of the proper magnetic separator, and engineering diagrams. Eriez Mfg. Co.

235—Coal Storage. Entitled "Economic Coal Storage", 8-page educational booklet is suited as a training aid on safe, orderly coal-handling methods. Teaches how to store coal with the most flexible type of equipment at low operating cost. Allis-Chalmers Mfg. Co.

236—Coal Crushers & Pulverizers. Facts about efficient coal preparation for power plants are presented in 8-page bulletin. Shows how coal is split, not crushed, thereby offering improved combustion and reduced ash-pit loss through uniform coal sizing. Speed, capacity, horsepower, weight and dimensions of the units are listed in convenient tabular form. American Pulverizer Co.

For more information use one of the convenient reply cards on page 101. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

237—Ash-Handling Systems. This company's approach to the ash-handling problem is presented in 20-page brochure. Although it advises that specific problems are better solved by an engineering discussion, various schemes are briefly described. Basic arrangements and advantages of Hydrojet systems are given descriptively and diagrammatically. Detailed information on operating and construction advantages is contained together with cutaway views and photographs that show the equipment at work. Allen-Sherman-Hoff Co.

238—Fork Lift Trucks. Silent Hoist shows you how to lower handling costs in 6-page folder. Describes line of improved heavy-duty fork lift trucks. Gives engineering features along with dimensional drawing and on-the-job photographs. Silent Hoist & Crane Co., Inc.

239—Magnetic Pipeline Trap. Protect your equipment from tramp iron with pressure-tight device used to remove tramp iron from pipelines carrying liquids and semi-liquids. 2-page bulletin lists complete description, specifications, construction features, and various advantages. Eriez Mfg. Co.

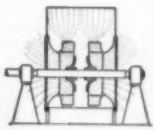
240—Flat-Top Conveyer Chain. Dimensions and pertinent data on light, durable, efficient, flat-top conveyer chain and its cut tooth sprocket wheels are given in 4-page bulletin. Various design and construction features are listed and pictured. Engineering data include formulas used in calculating chain pull and hp requirements. Link-Belt Co.

241—Sling Chains. Wrought iron sling

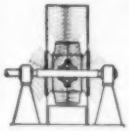
(Continued on page 112)

ANOTHER pd DEVELOPMENT

Gives you GREATER CONVERSION OF VELOCITY PRESSURE TO STATIC PRESSURE



How P-D split wheel assists diffusion—aids distribution throughout the fan.

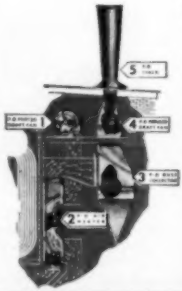


Conventional double wheel with common disc produces concentration, results in poor diffusion.

Performance ratings of the Prat-Daniel F-D Fan are established according to the Standard Test Codes adopted by N.A.F.M. and the A.S.H.V.E.

Design characteristics provide unusually high conversion of Velocity Pressure to Static Pressure. This is accomplished by streamlined inlet cones that are larger in proportion to the wheel than are usually found in forced draft fans. The unusual depth of the cones provide a wider housing than would customarily be used, increasing the space available for diffusion. Precisely fashioned backward curved blades provide a nearly perfect aerodynamic flow across both leading and trailing edges. Double wheel fans are spaced apart to permit four way diffusion of air, further contributing to this conversion. Peak efficiency and horsepower curves fall well within normal fan selection range, offering the optimum in maximum efficiency and non-overloading characteristics.

These are all carefully researched features that have made the Prat-Daniel F-D Fan a highly efficient apparatus. Check these features before you decide on your next fan. Write for catalog No. 300 today.



UNIT RESPONSIBILITY

The Thermix Corp., project engineers for the Prat-Daniel Corp., offer all components required for the handling of air and gas: (1) P-D Forced Draft Fans; (2) P-D Air Pre-Heaters; (3) P-D Tubular Dust Collectors; (4) P-D Induced Draft Fans; and (5) P-D Fan Stacks. This unit responsibility, by a well known firm, relieves the engineer of the necessity of integrating equipment from various sources into the over-all project.

Sales and Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONN.

Canadian Affiliates: T. C. CHOWN, LTD.
1440 St. Catherine St. W., Montreal 25, Quebec
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Designers and Manufacturers

PRAT-DANIEL CORPORATION

SOUTH NORWALK, CONN.

The RIGHT heat, RIGHT where it's needed . . .

with TRANE GAS UNIT HEATERS

Solve gas unit heating problems once and for all with this new Trane Unit Heater. It's simple, it's safe . . . it's ruggedly built for extra years of trouble-free service.

The heart of the unit is the new Trane light-weight heat exchanger that's "built like a boiler." Beaded and flanged tube-to-endsheet construction is rigid, airtight and permanent. No furnace cement needed to hold this unit together! Staggered arrangement of tubes creates wiping effect with heated air for more efficient heat exchange. The unit is designed for easy cleaning without removing the casing.

Easily accessible "burner drawer" innovation saves time, simplifies maintenance. No casings to disassemble, no seals to break to get at the burners on the new Trane Unit . . . the complete burner assembly slides out like a desk drawer.

Quiet, efficient Trane Fans are expressly designed for unit heater requirements. Broad, all-steel blades push large quantities of air over the entire heating surface. Built-in draft diverter, one-piece cast iron burners and automatic safety controls. AGA and Underwriters' Laboratories approved. Seven models between 50,000 and 210,000 BTU input.

Famous Trane Louver Fin Diffuser fits all Trane Gas Unit Heaters. A finger-tip adjustment tailors the air stream to just the right heat pattern for each location. Compensates for changes in floor plan, partitions, working area without changes in the unit heater installation. Put the *right* amount of heat *right* where it's needed with Trane Gas Unit Heaters.

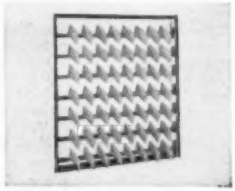
The Trane built-like-a-boiler heat exchanger with beaded and flanged tube-to-endsheet construction.

Typical installation where Trane Gas Unit Heaters provide plenty of warmed air for spot heating requirements.

Burner assembly slips out like a drawer—saves time, simplifies maintenance.

All steel, broad bladed Trane Fan is especially designed for unit heaters.

The famous Trane Louver Fin Diffuser. Finger-tip air stream control both vertically and horizontally.

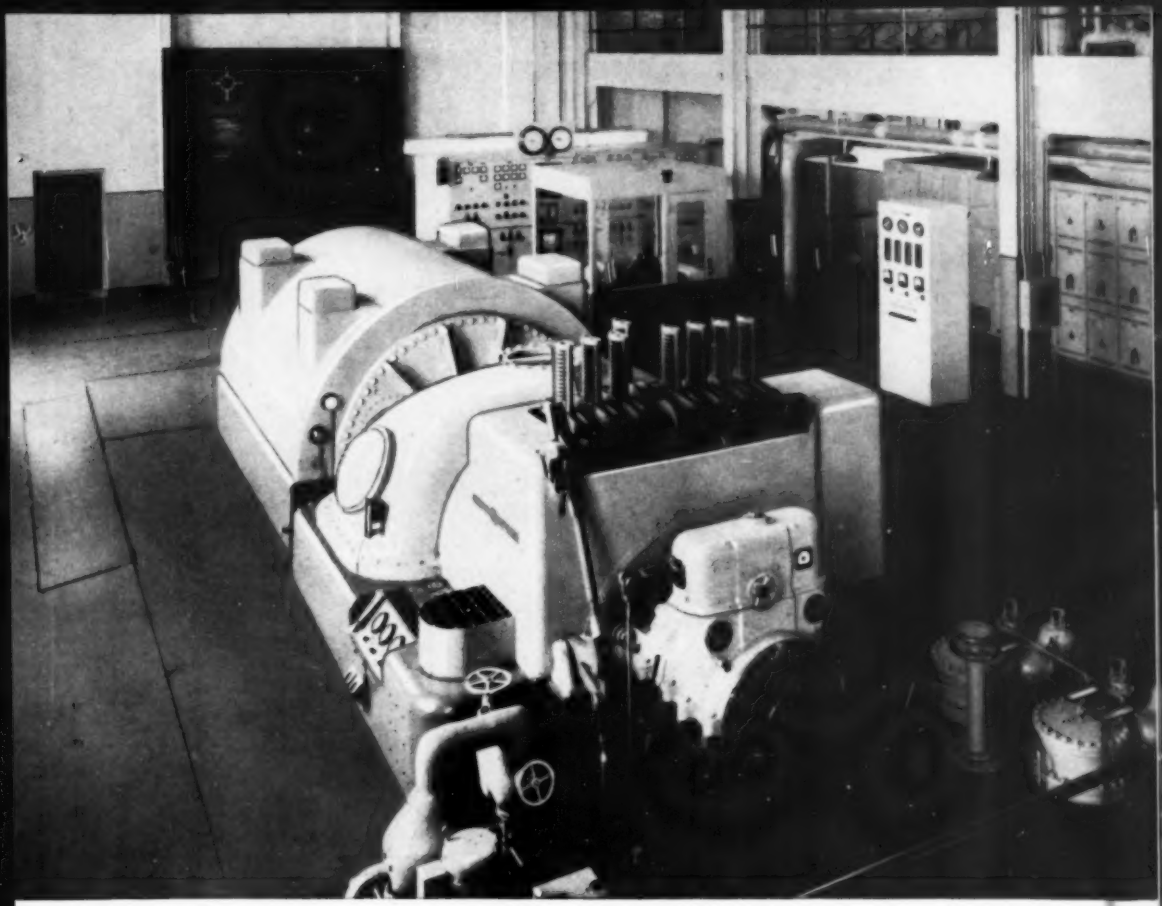


Heating problems of all types are easily solved with units from the complete Trane Unit Heating Line. Gas, steam or hot water . . . BTU's by the thousands or by the millions . . . propeller or blower type—Trane makes them all. For an unbiased recommendation of the right unit, in the right size for any unit heater requirement large or small, contact your nearest Trane field representative.

TRANE

The Trane Company, La Crosse, Wisconsin • Eastern Mfg. Division, Scranton, Pa. • Trane Company of Canada, Ltd., Toronto . . . Unit Heaters, Convectors, Heating and Cooling Coils, Fans, Compressors, Air Conditioners, Unit Ventilators, Special Heat Exchange Equipment, Steam and Hot Water Specialties.

MANUFACTURING ENGINEERS OF HEATING AND AIR CONDITIONING EQUIPMENT • OFFICES IN 80 CITIES



New turbine is slated for trouble-free life

IN 1949 when this 21,000-KW turbine was put in operation in a midwest power company, officials saw no problem in keeping maintenance at a rock-bottom low. Experience covering 16 years' operation convinced them that they had the answer—NONPAREIL Turbine Oil. They had already put NONPAREIL into three 5,000-KW units—in 1933, in 1935, and in 1940, respectively.

To this day the oil in these units has not been changed, yet there have been no oil-deterioration troubles, no deposit troubles, no high-acidity troubles. In fact oil neutralization numbers have remained below 0.10 mg. KOH/gm.

Consider that record as applied to minimizing your maintenance and costs . . . no oil replacements, no removal of oil for treating, no downtime for cleaning oil systems that stay entirely clean. Moreover, there is no time limit on these benefits. You will receive with each fill of oil a written guarantee that NONPAREIL Turbine Oil will last as long as your turbine, and that its neutralization number will stay below 0.15 mg. KOH/gm.

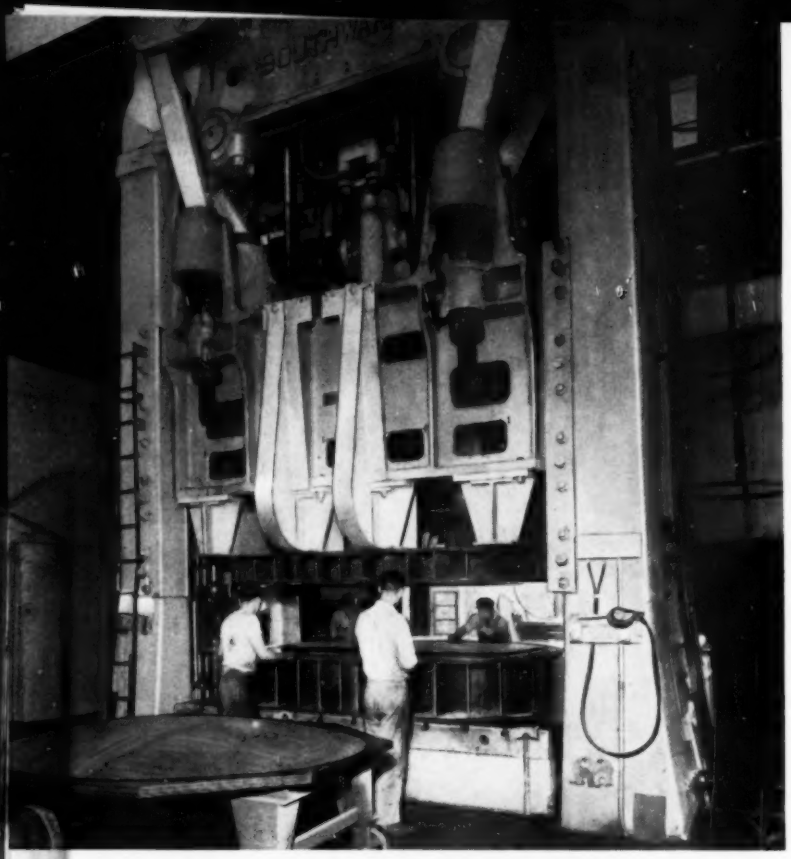
Have a Standard Oil lubrication specialist show you service records that, in each case, cover 21 years of continuous operation on NONPAREIL Turbine Oil. Ask him for case histories that show how NONPAREIL has reduced utility lubrication costs as much as 68%. You can reach a lubrication specialist through your local Standard Oil Company (Indiana) office. Or, if you wish, write:

Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

NONPAREIL
TRADE MARK
Turbine Oil

STANDARD OIL COMPANY (INDIANA)

STANDARD



Answer to a "Pressing" need . . .

TROUBLE-FREE hydraulic operation of a new toggle press was particularly important to the Brown Steel Tank Company of Minneapolis. Such operation would keep costly inspections of the hydraulic unit at a minimum—production at a maximum.

A Standard Oil lubrication specialist was called in. He recommended STANOIL Industrial Oil for this vital hydraulic job. During three years of hard, continuous service (hydraulic unit operates 2000 P.S.I. maximum), STANOIL has stayed on the job and has permitted efficient hydraulic operation. It has not been necessary to inspect the hydraulic unit in all of this time. A recent sample test showed the hydraulic oil to be in excellent condition.

STANOIL will give long oil life and trouble-free service in a wide variety of equipment: speed reducers, head stock gears, auxiliary turbines, compressors, as well as hydraulic systems. STANOIL is fortified to combat rust and corrosion.

STANOIL
TRADE MARK
Industrial Oil

Your nearby Standard Oil lubrication specialist is ready to explain how your plant may obtain maximum benefits from STANOIL and other high-quality petroleum products.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for his prompt attention.

What's YOUR problem?

Meet C. K. Olsen, lubrication specialist in Standard Oil's Minneapolis office.

Consulted by the Brown Steel Tank Company, he recommended STANOIL Industrial Oil as the answer to their needs. As a result, he helped the company realize significant savings in operating costs.

Standard Oil lubrication specialists are located throughout the Midwest. Just phone or address a card to the nearest Standard Oil Company (Indiana) office for the services of the specially trained lubrication specialist near your plant.

With his help, find out how many different oils in your plant can be replaced by STANOIL Industrial Oil on such applications as:

Air compressors . . . no sticking or clogging of valves, less oil consumption in splash or circulating systems.

Speed reducers . . . less wear of gears and bearings during frequent cold starts or prolonged high-temperature operation.

Steam turbines . . . freedom from emulsions and sludge, fewer oil changes necessary.

Ring-oiled bearings . . . rings function immediately on starting, less bearing wear.

Circulating and bath systems . . . one oil for a wide variety of jobs.

STANDARD OIL COMPANY (INDIANA)

Are 10,000 pumps enough for you?

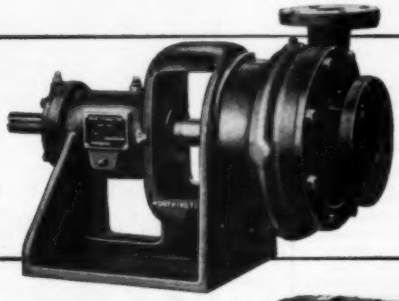
Just about. It takes that many different combinations to make sure that you—big user or small user—get exactly the right pump you need.

That's why we manufacture Worthington centrifugal pumps in over 10,000 standard combinations of capacities, heads, casings and mountings.

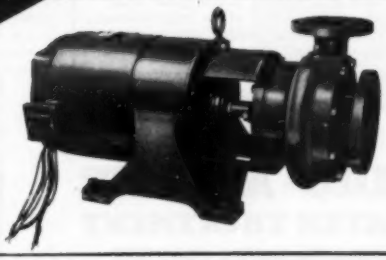
Types CN (frame-mounted) and DN (built-in motor) are made in capacities from 10 to 1800 gpm, heads to 535 ft., with 40 sizes of pump casings and 200 combinations of frame-mounted designs.

And—maximum interchangeability of parts!

Get the habit of asking for a Worthington—you'll get exactly the pump you want.



Type CN, frame-mounted, is a real "any-drive" pump—readily driven by electric motor, V-belt, or any other source of mechanical power.



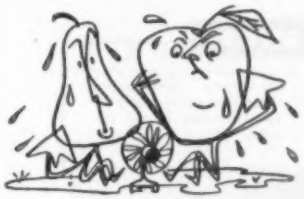
Type DN is the famous Worthington Monobloc design—compact, streamlined, with built-in motor. On both types, liquid ends are interchangeable, and can be equipped with either conventional packing or mechanical seal.

WORTHINGTON

THE GOOD RIGHT HAND OF INDUSTRY

POWER TRANSMISSION: sheaves, V-belts, variable speed drives. PUMPS: centrifugal, power, rotary, steam. AIR COMPRESSORS: water-cooled, air-cooled. P.C.D.9

The Fruit Was in a Sweat



. . . and So Was the Pump

They suddenly began having a hot time of it at a fruit and produce company near the Dillon Supply Company in Raleigh, N. C.

A centrifugal pump used in their refrigeration system had called it a day, and the temperature was rising in the rooms where the produce was kept. Without refrigeration, the perishables would have indeed perished.

But a frantic call to Dillon located, in the distributor's stock of Worthington centrifugal pumps, exactly the size needed. Prompt delivery . . . and not a lettuce leaf was allowed to wilt.

It's another example of the wisdom of depending on your Worthington Distributor. No distributor offers *more* pumps . . . no distributor offers more *value* in pumps . . . than a Worthington distributor.

Worthington Pump and Machinery Corp.
Pump and Compresser Marchandising Div.
Harrison, N. J.

Send latest bulletin on Worthington Centrifugal Pumps. Any other (type).....

Name.....

Company.....

Address.....

City.....State.....

CONCENTROL STOPS FOAMING

BEFORE

Laboratory demonstration shows foaming of highly alkaline solution in test cylinder.

This laboratory demonstration shows — as do scores of successful installations — that Bird-Archer's Concentrol is a highly effective anti-foam agent. It quickly stabilizes alkaline boiler water . . . eliminates foaming action and carryover. With Concentrol, you can forget about bouncing water gages. You get good quality dry steam every hour of every day.

Concentrol is available in liquid, powdered or briquette forms. Special Concentrol formulations are also available containing other commonly used boiler water treatment chemicals such as tannins, phosphates, alkalies, sulfite, etc.

See for yourself how economical Concentrol helps improve steam quality. Your Bird-Archer representative will demonstrate Concentrol in your plant . . . make specific recommendations for its use. Consult him, or write direct to Bird-Archer, outlining the details of your boiler operation.

FREE DATA SHEET AVAILABLE

HOW CONCENTROL WORKS

Concentrol works by effecting a rapid change in surface tension of steam bubbles which permit coalescence of small steam bubbles into bubbles of larger sizes. This results in the formation of unstable bubble films which break readily upon reaching the steam disengaging surface of the boiler water. This does away with foam build-up and subsequent carryover.

BIRD · ARCHER

WATER TREATMENT

THE BIRD-ARCHER COMPANY

400 Madison Avenue, New York 17, N.Y.

PHILADELPHIA · CHICAGO

IN CANADA

The Bird-Archer Co., Limited
503 McGill Building, Montreal, Canada

IN MEXICO

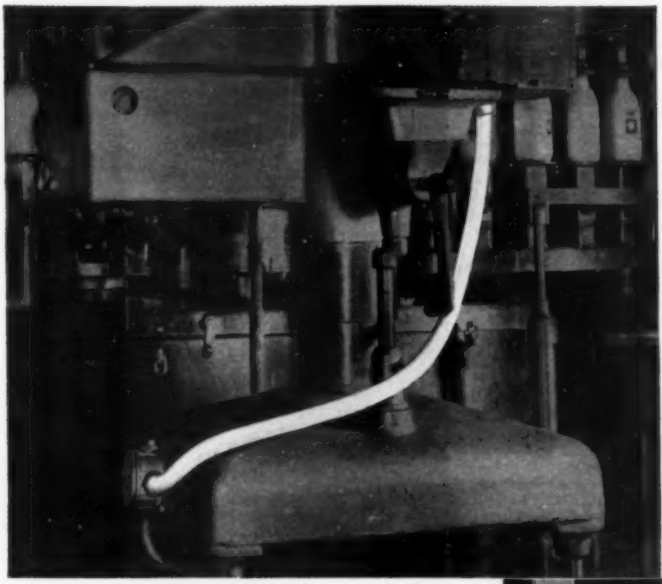
Calderas y Accesorios, S. A.
Amsterdam 291, Mexico D. F.

BA 163

AFTER

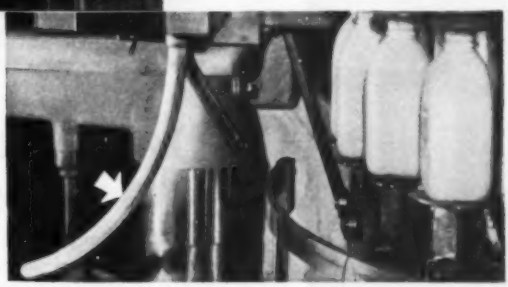
Same solution after addition of 12 ppm of Concentrol Anti-foam. Constant heat conditions were maintained during test.

"Here's why SEALTITE flexible conduit advantages are so important to us,"



. . . says Mr. L. L. Kiley, manager of The Borden Company's Long Island City milk processing plant.

(BELOW)
Long Island City, N.Y., plant of The Borden Company showing Sealtite Flexible Conduit (note arrow) on Seal-Hood milk bottle hooding machine built by The American Seal-Kap Corporation.



Mr. Kiley continues...

"As you see, Sealtite* Flexible Conduit carries the power wires in this Seal-Hood milk bottle hooding machine. Naturally, it has to be flexible to permit adjustments for capping bottles of various sizes.

"And it has to withstand hard usage because it's exposed to live steam, cleaning compounds, water and accidental crushing. Yet it takes them all without trouble, and its smooth, continuous, synthetic jacket meets every sanitary requirement."

SEALTITE is the ideal flexible electrical conduit for wiring on machines, motors, controls, etc.; for protecting wiring against water, oil, grease, chemicals or abrasion; for cramped space or difficult connections.

Sealtite has a core of flexible galvanized steel tubing covered with a synthetic jacket (generally furnished in black), is supplied in long random lengths and uses same type of fittings as rigid conduit. Sealtite is available at your electrical supply house. For detailed information or literature on Sealtite, write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

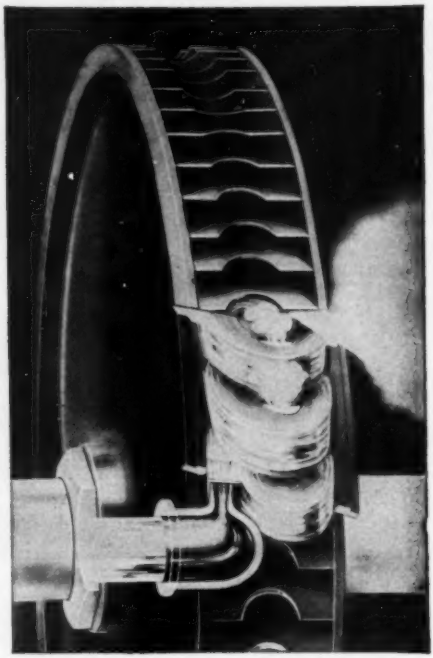
*Trademark 51224

wherever connectors must move...

American ANACONDA

FLEXIBLE METAL HOSE AND TUBING

TERRY



Action of steam in Terry wheel turbine. The steam issues from an expanding nozzle at high velocity and enters the side of the wheel bucket in which its direction is reversed 180°. As this single reversal uses but a portion of the available energy, the steam is caught in a stationary reversing chamber and returned again to the wheel. This process is repeated several times until practically all of the useful energy has been utilized.

NO PARTS TO LOOSEN OR WORK OUT

The rotor of the Terry Wheel Turbine is a single forging of special composition steel, in which a series of semi-circular buckets is milled. There are no separate parts to become loose or work out.

The power-producing action of the steam takes place on the solid curved backs of these buckets or pockets. Therefore close clearance is unnecessary and wear on the blades forming the pockets is of little consequence, as it does not materially affect horsepower or efficiency.

For detailed information about this effective construction and its advantages, write us on your business letterhead for a copy of Terry Turbine Bulletin S-116.

T-1172

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.

ERIEZ MAGNETIC ATTRACTIONS

ERIEZ MANUFACTURING CO., ERIE, PA., U.S.A. • PRODUCERS OF MAGNETIC SEPARATORS AND SELLERS OF (RCA) ELECTRONIC METAL DETECTORS

IT'S A FACT...734,254 BEEF LIVERS AND 5956 CARCASSES WERE CONDEMNED IN A YEAR BECAUSE OF ABSCESS AND PERICARDITIS CAUSED BY *TRAMP IRON* IN CATTLE FEED LOSS...OVER 3 MILLION DOLLARS! *ERIEZ* ATOMAGNETS FIGHT THIS BECAUSE THEY WON'T LET TRAMP IRON PASS.

TO KEEP THE WALLS UP THEY USED *ERIEZ* PERMANENT PLATE MAGNETS IN GRAVITY FLOW CHUTES AT AN OHIO CHEMICAL PLANT. WITHOUT THIS PROTECTION FROM TRAMP IRON SPARKING, EXPLOSIONS WERE SO FREQUENT.... 9 A DAY AVERAGE.... THAT THE WALLS WERE MADE TO FALL OUTWARD AT THE SLIGHTEST BLAST TO AVOID MAJOR DAMAGE!

..... SINCE INSTALLATION ..... **NO EXPLOSIONS!**

YOU DON'T HAVE TO BEAT THIS DRUM ...FOR RESULTS. THE *ERIEZ* MAGNETIC *DRUM* AUTOMATICALLY REMOVES STRAY IRON.... SOME DANGEROUS TO MACHINERY.... SOME THAT CAN BE SOLD. *USED IN EVERY INDUSTRY!*

FIVE DOLLARS SAVED A YEAR FOR EACH DOLLAR INVESTED... THE RESULT OF *ERIEZ* MAGNETIC HUMP SEPARATOR INSTALLATIONS AT A SOUTHERN TEXTILE PLANT...*WOODSIDE MILLS*. AVERAGE NUMBER OF FIRES *BEFORE ERIEZ* HUMPS WERE IN...*12* PER YEAR! *AFTER INSTALLATION*..... NO FIRES...NO PRODUCTION DELAYS!

ERIEZ MANUFACTURING COMPANY
208 STATE STREET, ERIE, PA.

MY CONTAMINATION OR SEPARATION PROBLEM IS:

_____

_____

PLEASE SEND LITERATURE ☐

HAVE REPRESENTATIVE CALL ☐ PROMPTLY ☐ WHEN IN AREA

NAME _____

TITLE _____

COMPANY NAME _____

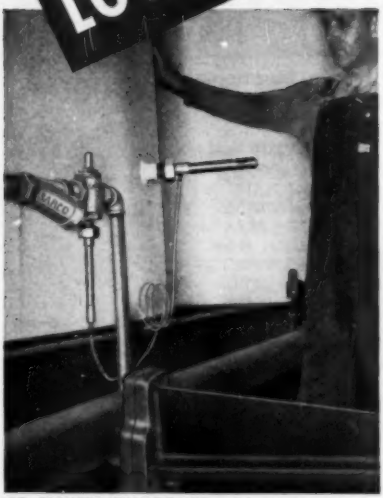
STREET _____

CITY _____ ZONE ____ STATE ____

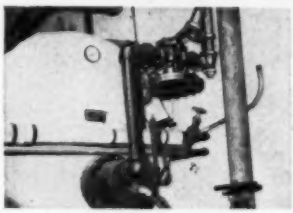
BID

LOW COST *Insurance*

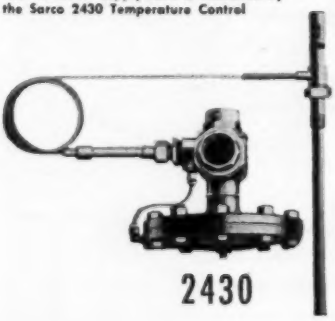
FOR HIGH COST OILS WITH SARCO TEMPERATURE CONTROL

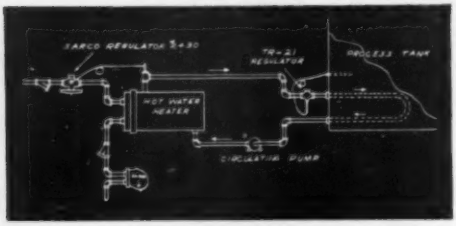


AT SPENCER-KELLOGG CO., Edgewater, N. J.



The hot water supply tank is controlled by the Sarco 2430 Temperature Control





The edible oils processed in this plant discolor or scorch only a few degrees above their melting points which range from 77° on cocoanut oil to 105° for soy bean oil. How to protect the several hundred thousand dollars worth of oils in these eight tanks, all requiring different temperatures, was the problem.

Sarco engineers studied the job and recommended hot water as the heating medium instead of steam. By keeping the heating coil surface just hot enough, but not too hot, scorching the oil is prevented but output maintained. Each tank is controlled by a TR-21 regulating the hot water flow and a 2430 controls the hot water supply temperature.

RESULTS: What was a constant worry to both management and the operators is now a 24 hour security. There is no possibility of discoloring because of too much heat, nor of caking because temperatures are too low. The human element is eliminated as a source of error — and of course, the tanks use less heat.

FOR YOUR TANKS: There are many combinations of Sarco Steam Traps and Temperature Controls for open and closed tanks, indoors or out. It costs nothing to find out what this kind of insurance would cost.

TR-21 TEMPERATURE REGULATOR

Each of the eight tanks is individually controlled by a Sarco TR-21

SARCO PIPE-LINE STRAINERS

Sarco self-cleaning pipe line strainers are placed ahead of each control

301

SARCO SAVES STEAM

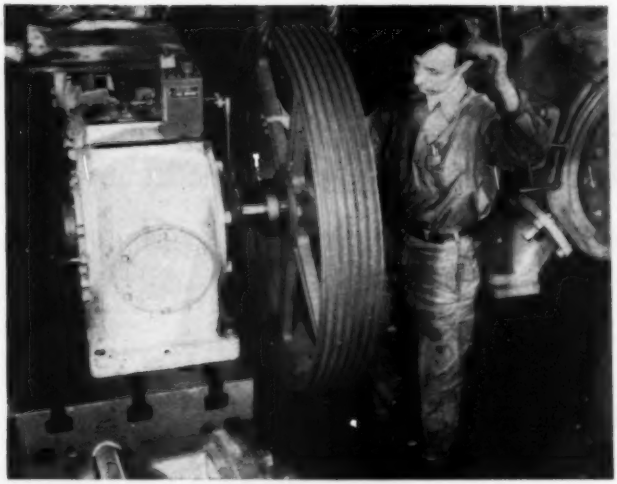
SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

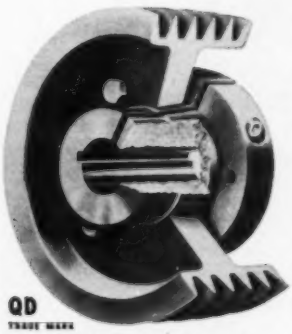
SARCO CANADA, LTD., TORONTO 8, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT



Pick the V-Belt Sheave

which all industry likes best



QD
TRADE MARK

Split hub is clamped to shaft. Heavier taper-bored rim slides easily over tapered hub—no keyway obstruction on cone surface. Positive press fit on shaft. Large, long pull-up bolts also used as jack screws to remove rim.

Here's a 26-word description of the V-belt sheave that is used more than any other.*

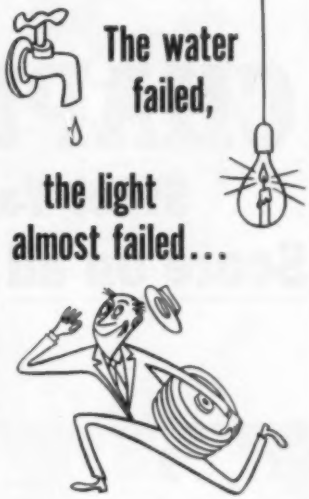
Two parts for easy handling—separately or together. Split hub and tapermated rim make mounting easy. No realignment problem—clamped hub stays put while changing rims.

That's Worthington's QD—the original tapered cone-grip sheave that's preferred by men who have to install or change sheaves. The QD is *easy to get on, easy to get off, yet always tight on the shaft* —tighter than any other sheave on the market. Hubs for every bore—lower inventory cost.

For your machines, pick Worthington Multi-V-Drives with QD sheaves and Worthington-Goodyear EC Cord V-belts.

Complete range of stock sizes—prompt shipment from distributors everywhere.

**In addition to being one of the largest-selling sheaves, the popular Worthington QD design is licensed to many other sheave manufacturers. For your protection, dimensions are standardized to permit interchangeability.*



but the distributor "came through"

A hydro-electric plant, crippled by drought, was threatened with losing its franchise; was given 60 hours to bring its service up. Two Diesel engines were about to arrive when somebody remembered to order the V-belt drives.

A call to **Anderson-Crane Rubber Company**, Worthington distributor in Minneapolis, located four large D-section QD sheaves and 25 Worthington-Goodyear steel cable V-belts. These were rushed by car at night to the power plant, arriving just ahead of the engines. Within 24 hours, the plant was producing full power.

Once again, the Worthington distributor was *on the job*—with the needed supplies and the prompt service!

WORTHINGTON

THE GOOD RIGHT HAND OF INDUSTRY

POWER TRANSMISSION: sheaves, V-belts, variable speed drives

PUMPS: centrifugal, power, rotary, steam

AIR COMPRESSORS: water-cooled, air-cooled

Worthington Pump and Machinery Corporation
Multi-V-Drive Sales Division
Buffalo, New York

Send Bulletin V-1400-B7F on Worthington Multi-V-Drives.

Name.....

Company.....

Address.....Zone....State...

MV.1.3

CHAPMAN

Steel Valves Score on all 3 Points

1
CHAPMAN STEEL VALVES have the high precision ratings of custom-made valves — but the economy of production-line manufacture.
2
CHAPMAN STEEL VALVES are made exclusively from quality-controlled steels developed and produced in Chapman's own foundries under control of Chapman's own outstanding metallurgists.
3
CHAPMAN STEEL VALVES are designed to equal or surpass — A.S.A. and A.P.I. Standards in all pressures and temperature ranges.
CHAPMAN
STEEL

Be sure to see Chapman first whenever you need steel valves — gate, globe, angle or check. As a result of Chapman's long years of research and experience, they are tops in every respect.

The Chapman Valve
MANUFACTURING COMPANY
INDIAN ORCHARD, MASS.

For 3500 years,
ramie fiber resisted rot
in an Egyptian tomb...

Now...Johns-Manville makes ramie fiber into the rot-resistant packing...

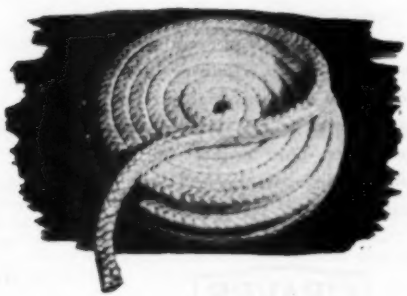
That's why *NAVALON* stands up where other packings fail!

IN PLANT AFTER PLANT, this new Johns-Manville packing made from ramie fiber is establishing new records in reciprocating service against fresh or salt water, brine, cold oil and many other liquids.

Navalon's rot-resistant properties are only one reason for these outstanding performance records. Navalon also has the high tensile strength inherent in ramie, nature's strongest fiber. An exclusive Johns-Manville process of manufacture gives it unusual lubricating properties, too—another reason for its ability to outlast other cold liquid service packings. And, in addition, Navalon is free from any tendency to score.

In the toughest service, users are finding that this unique combination of properties not only means less repacking—it means less wear on rods and plungers as well—money-saving performance all around.

Why not investigate Navalon as a means of increasing packing life and reducing costs in your plant? Get in touch with your packing distributor, or send for folder PK-32A that tells the full story. Just fill in the coupon below.



Johns-Manville
PACKINGS & GASKETS

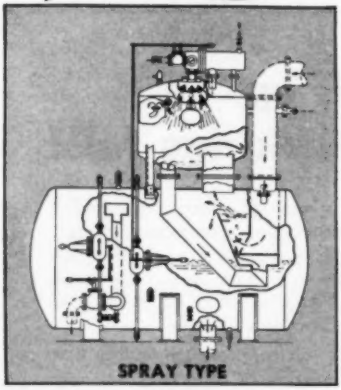
Johns-Manville
Box 290
New York 16, N. Y.
Please send me your folder on Navalon Packing (PK-32A).

Name_____
Company_____
Address_____
City_____ State_____

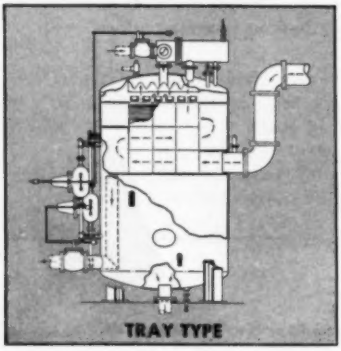
IP-4

Writes this user of a
Graver Deaerating Heater...

> With 100% make-up water, your unit produces zero oxygen, and this office and the owners are very well pleased with the performance of the unit.



SPRAY TYPE



TRAY TYPE

Here is part of a letter which we recently received from a midwestern engineering firm concerning the performance of a Graver Deaerating Heater installation at a large public institution of which they were in charge.

This spontaneous testimonial is typical of the reports we continuously receive from users of Graver Deaerating Heaters. Whether the units are Spray or Tray type . . . operating on steady or fluctuating loads . . . or with small or large amount of boiler feed make-up . . . a Graver installation can be depended upon to produce zero oxygen and to eliminate carbon dioxide.

Graver's 40 years of experience and pioneering leadership in water conditioning are at your service to solve your water treating problem. Whatever your needs may be, you can be sure of modern, highly effective equipment based on the latest proven developments in water conditioning processes. Your request for authoritative advice and complete information will not involve the slightest obligation on your part.

GRAVER

GRAVER WATER CONDITIONING CO.

Division of Graver Tank & Mfg. Co., Inc.

GW-430

216 WEST 14th STREET, NEW YORK 11, N. Y. • CHICAGO • PHILADELPHIA • CLEVELAND

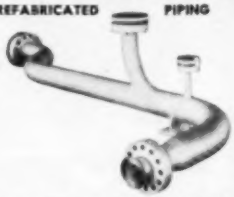
EVERYTHING FOR PIPING

PIPE HANGERS and SUPPORTS

CAST IRON FITTINGS

WELDING FITTINGS

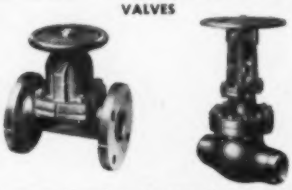
PREFABRICATED PIPING



MALLEABLE IRON FITTINGS

FORGED STEEL FLANGES

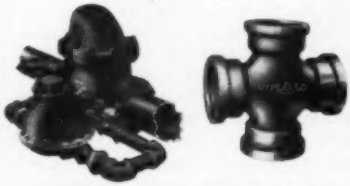
VALVES



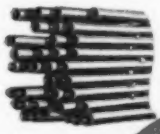
STEEL NIPPLES

THERMOLIER UNIT HEATERS

WATER WORKS SPECIALTIES



PIPE



PLUMBING and HEATING SUPPLIES

Whatever your requirements for pipe, fittings, valves and other standard piping materials, you can get prompt delivery from a Grinnell warehouse or jobber. When the job calls for specialized piping products or installations, Grinnell has the manufacturing facilities, products, experience and engineering knowledge to "deliver the goods".

at your nearby GRINNELL Warehouse or Jobber

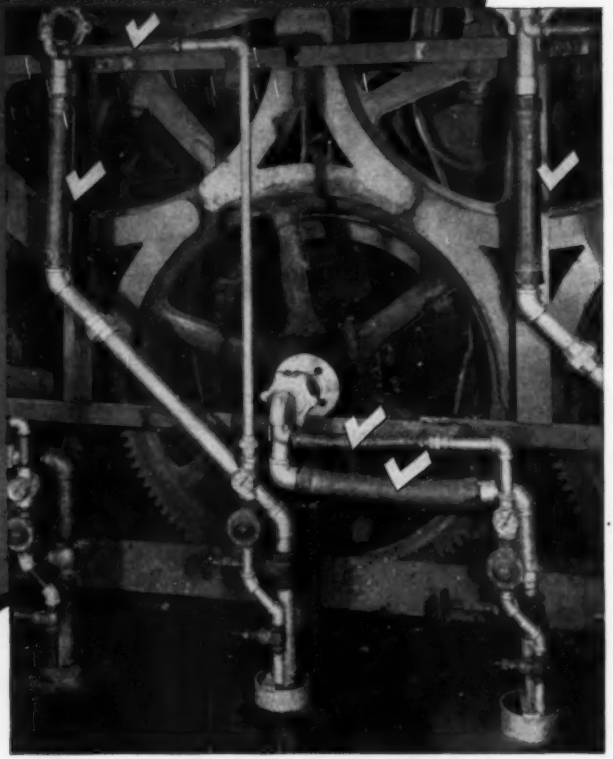
GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

CMH FLEXIBLE METAL HOSE

cuts maintenance ...helps keep dryer temperatures constant on this paper machine



By replacing rigid pipe connections to the dryer cylinders of this paper machine with sections of CMH Flexible Metal Hose it was possible to reduce maintenance and minimize paper spoilage due to improper drying. In the rigid pipe hook-up, vibration in the machine caused early failure of the packing in the rotary joints. Steam loss through the damaged packing and its attendant temperature drop resulted in insufficient drying, necessitating the discarding of this paper. CMH REX-WELD corrugated, braid-covered, bronze hose installed as steam inlet and condensate return connections to the rotary joints absorb the vibration and end this damage to packing. In addition, the flexible metal hose corrects for misalignment, takes any normal motion in the system and absorbs thermal expansion and contraction.

With production demands at their present level, don't risk spoilage of your product or complete shut-down resulting from faulty connections. Check your connections now. All those subject to vibration, misalignment, flexation or expansion and contraction should be replaced with CMH Flexible Metal Hose. There's a size and type to meet every need. For full details call your CMH distributor. Look for him in the classified telephone directory or write for his name.

See Our Catalog in Sweets' File

Flexon identifies CMH products that have served industry for over 49 years.

CHICAGO METAL HOSE Corporation

1335 S. Third Ave. • Maywood, Ill. • Plants at Maywood, Elgin, Rock Falls, and Savanna, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

CMH

ONE DEPENDABLE SOURCE
for every flexible metal hose requirement

Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems
Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components

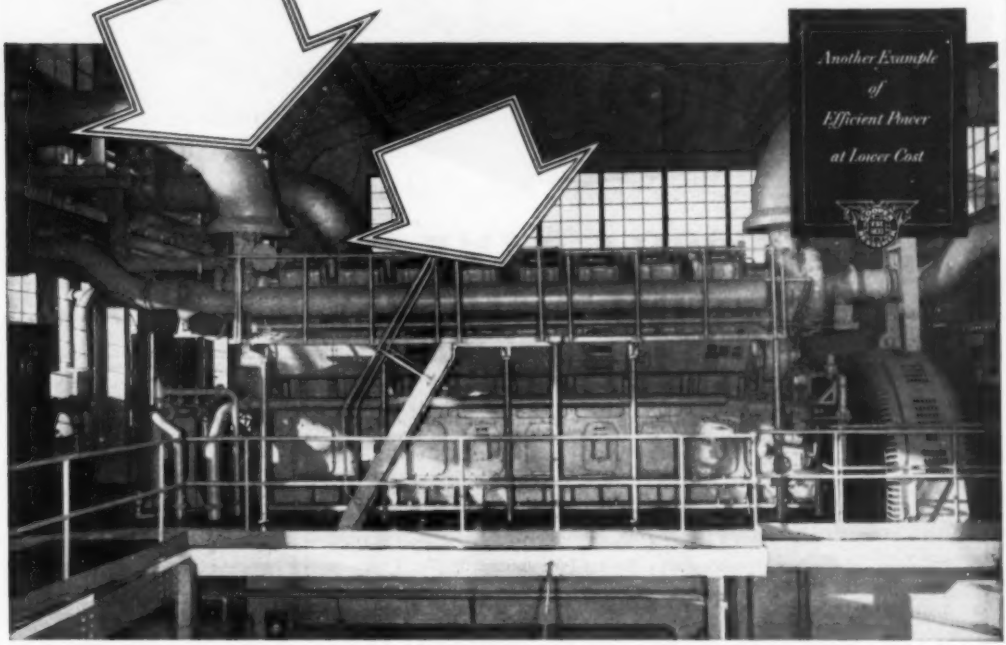
Keynote at Yuma

NEW ECONOMY IN THE COST OF POWER

In planning one of the most modern power plants of its kind, Arizona-Edison was quick to take advantage of the latest developments in engine design and performance. Cooper-Bessemer takes pride in not only introducing these developments but in furnishing the two supercharged gas-diesels that power this outstanding plant at Yuma, Arizona.

One of these engines is shown below—a well-proved type LS, featuring the new space-saving "V" design hence called the LSV. This supercharged, 16 cylinder gas-diesel not only achieves a new low in fuel consumption (6,500 B.T.U./hp/hr. or less) but its "V" design virtually doubles the power-to-space ratio. Still another feature is simple, fast conversion to 100% gas, spark-ignited operation . . . at will!

Weigh the immediate and continuing value of these advancements and you'll appreciate that *new* economy is indeed the keynote at Yuma. It is new economy that can be *yours*, too, with modern Cooper-Bessemers on the job.

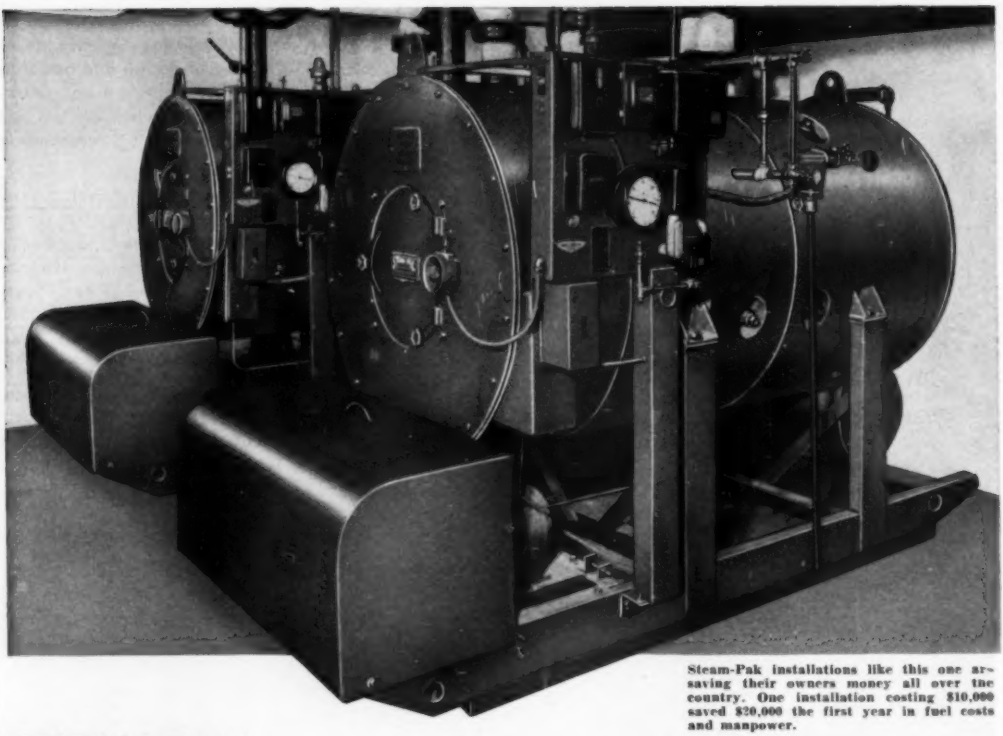


● *Power for Arizona-Edison's new Yuma plant is supplied by two modern Cooper-Bessemer gas-diesels: a supercharged, 16 cylinder 3,300 hp type LSV engine (shown here) and a supercharged, 8 cylinder, 1650 hp in-line LS. Both engines are quickly convertible to spark-ignited operation on 100% gas fuel.*

The Cooper-Bessemer Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York City Washington, D. C. Bradford, Pa. Chicago, Ill.
San Francisco, Calif. Houston, Dallas, Greggton, Pampa and Odessa, Texas
Seattle, Wash. Tulsa, Okla. Shreveport, La. St. Louis, Mo. Los Angeles, Calif.
Caracas, Venezuela Gloucester, Mass. Calmes Engineering Co., New Orleans, La.



Steam-Pak installations like this one are saving their owners money all over the country. One installation costing $10,000 saved $20,000 the first year in fuel costs and manpower.

STEAM-PAK YORK POWER GENERATOR
A PRODUCT OF YORK-SHIPLEY

WILL SAVE YOU MORE IN TIME & MONEY BECAUSE...

- Engineering design is recognized by top engineers and architects who specify Steam-Pak for quality and results.
- Satisfactory operation in thousands of buildings and plants all over the country prove Steam-Pak's ability to satisfy customers.
- Distributors chosen for their engineering ability, are trained to provide you with the best engineering "know-how" for installation and service of your equipment.

These are three basic reasons why Steam-Pak should be No. 1 on your list of steam generators. See your nearest York Power distributor, or write for complete details.

Steam-Pak Generators are built in capacities from 15 H.P. up, for low or high pressure, steam or hot water, for light or heavy oil, combination gas and oil, or straight gas.

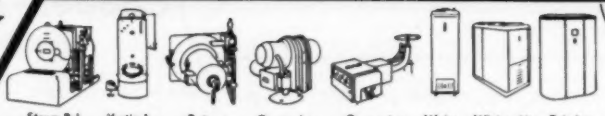
YORK SHIPLEY

416 JESSOP PLACE · YORK, PENNSYLVANIA · PHONE 7861

Industrial Division

INDUSTRIAL DIVISION YORK POWER

YORK HEAT RESIDENTIAL DIVISION



Steam-Pak Generators · Vertical Boilers · Rotary Oil Burners · Conversion Oil Burners · Conversion Gas Burners · Water Heaters · Winter Air Conditioners · Tubeless Boiler Units

JOHN ZINK CO.

AIR HEATERS

Recommended for Pre-heating, Drying, Dehydrating, Stress Relieving, Controlling Atmospheres and delivering air for Combustion.

The design is radically new and different. It will deliver truly homogeneous heat at the outlet. Any required supply pressure condition can be met with either oil or gas or both as fuels. The unit is compact, light weight, available for vertical or horizontal installation.

The special J Z Air Heater Burner is furnished complete with electric ignition gas pilot and complete safety control equipment as specified. These are available for local installation in air heating units, when desired.

—Ask us—

JOHN ZINK COMPANY

4401 So. Peoria **TULSA, OKLA.**

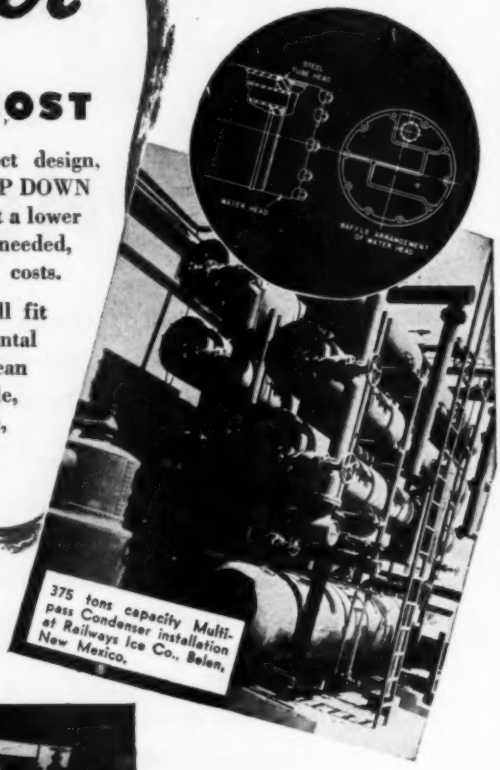
$ave Power and REFRIGERATION COST

Vogt Condensers, because of their correct design, STEP UP the rate of heat transfer and STEP DOWN head pressures. With the liquid delivered at a lower temperature, smaller compressor capacity is needed, saving in original as well as operating costs.

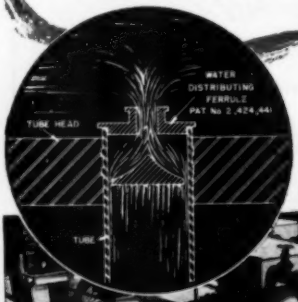
One of the two basic types illustrated will fit your operations exactly. Install Horizontal Multipass (closed type) for use with clean waters. Where the water is hard, forms scale, contains mud or promotes fungus growth, Vertical Single Pass (film type) which can be cleaned in operation, are recommended.

Horizontal Multipass Condensers
(Closed Type)

Water circulated in tubes traverses the length of the unit a number of times as determined by baffles in the heads.

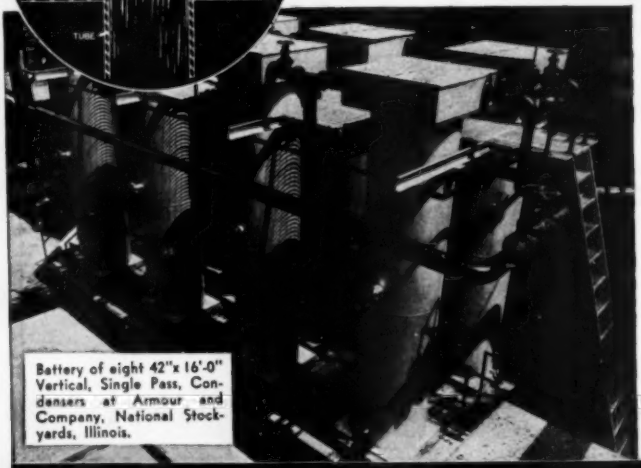


375 tons capacity Multipass Condenser installation at Railways Ice Co., Belen, New Mexico.



Vertical Single Pass Condensers
(Film Type)

Patented ferrules give equal distribution of water to and over the surfaces of all tubes in a unit.



Battery of eight 42"x 16'-0" Vertical, Single Pass, Condensers at Armour and Company, National Stockyards, Illinois.

HORIZONTAL and VERTICAL TYPES SHELL and TUBE CONDENSERS For Every Service

Write For Bulletin RC-1

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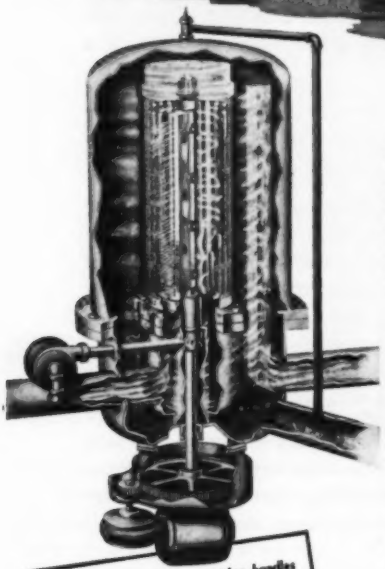
Vogt REFRIGERATION CONDENSERS

QUICK, HENRY, THE FILTER!



Permanent wire-wound cartridge handles full flow. Continuously self-cleaning—no flow interruptions. All-metal construction is abrasion- and corrosion-resistant.

If water's getting scarce in *your* area . . . use river or lake water for industrial purposes. Make it fit for those purposes by straining through a Cuno FLO-KLEAN Strainer to remove trash.

RECIRCULATE PROCESS WATER

Clean process water for re-use by passing it through a Cuno FLO-KLEAN—*guaranteed* to remove all solids larger than specified*, with negligible drop in pressure.

Even the FLO-KLEAN falls in with the spirit of saving water. Its cartridge cleaning system recycles the backwash—no waste.

INSTALL AND FORGET

The FLO-KLEAN takes care of its own cleaning, too. With continuous cartridge backwash cleaning and automatic top and bottom blow-down, it can be installed in a remote place and forgotten.

SAVE MONEY—AS WELL AS WATER

Some users have saved enough on water bills to pay the cost of FLO-KLEAN in a matter of *months!*

Send the coupon for full information on water-saving, money-saving FLO-KLEAN strainers.

**Available spacings from .0025 to .030 in. (220 to 20 mesh equivalent)*

FIND OUT HOW TO MAKE FLUIDS COME CLEAN AT LOWEST COST

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Complete Line
Fluid Conditioning

Removes More Sizes of Solids from More Types of Fluids

MICRONIC (Micro-Klean) • DISC-TYPE (Auto-Klean)
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Cuno Engineering Corporation
141 South Vine St., Meriden, Conn.

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Buell van Tongeren Cyclones
Can Help You...

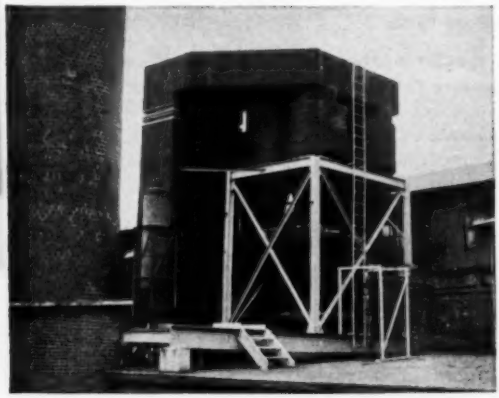
DO A REAL JOB of FLY-ASH COLLECTION on PULVERIZED COAL-FIRED BOILERS!

In plant after plant, where pulverized coal-fired boilers have presented seemingly fathomless fly-ash problems, Buell has come up with the answer.

Stated simply it is this: Sustained peak efficiency . . . with the exclusive van Tongeren Cyclone. PLUS—clog-proof, low maintenance construction.

What's more, with a Buell fly-ash collection system *you know your efficiencies beforehand!* You get a true indication of the actual performance of your Buell System—on the job! Performance that has proved capable of meeting even the most stringent demands (of local air pollution ordnances).

If you have a serious fly-ash collection problem, an inquiry will bring help in a hurry. Please address request for information to: Buell Engineering Company, Suite 5017, 70 Pine Street, New York 5, N. Y.



● After an exhaustive 5-year study, engineers at a Southern paper mill selected Buell van Tongeren Cyclones for their three pulverized-coal-fired boilers.

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Engineered Efficiency in **Fly Ash Collection**

ALL FOR ONE...

but not one for all jobs!

All of these B&W Refractories are designed for one job . . . to give you the longest possible boiler furnace service.

BUT NO ONE refractory can meet all furnace conditions. That's why B&W has developed this complete line of cost-cutting refractories to solve every furnace problem.

Whether your boiler produces 10,000 or 1,000,000 lbs. of steam per hour, you can be sure of getting expert refractory recommendations from your B&W Refractories representative. He can show you how to decrease costs and increase furnace life with the proper B&W Refractory for your application. Drop us a postal card to obtain the name of your nearest B&W Refractories Engineer.

HEAVY FIREBRICK—

For oil fired furnaces with flame impingement or spalling or slagging conditions, either *B&W 80* or *Junior Firebrick* can be used. 80's assure uninterrupted service at extremely high ratings. Juniors are recommended where load bearing and temperature requirements are less severe, but too severe for the best grades of fire-clay brick.

INSULATING FIREBRICK—

B&W Insulating Firebrick have the lightest weight and lowest heat conductivity of any insulating firebrick in their class. They store and conduct less heat—withstand direct exposure to furnace gases. Available in six types for temperatures from 1600 F to 2900 F.

PLASTICS—

Used widely for repairs and for forming special shapes *in place*, B&W *Plastic Moldable* and *B&W Plastic Chrome Ore* offer long life under severe conditions. Plastic Moldable is suitable for use in the great majority of furnaces. It withstands temperatures up to 3000 F. Plastic Chrome Ore is ideally suited for severe slagging conditions.

CASTABLES—

In furnaces that require the high resistance of chrome to chemical attack and where speed of installation is important, B&W offers *Kromecast* for temperatures up to 3100 F and *Hydrochrome* for temperatures up to 2800 F.

For burner openings, door linings, walls, roofs and arches, B&W *Kaocast* possesses unusual volume stability and resists spalling. It easily withstands temperatures up to 3000 F.

B&W Baffle Mixes are excellent castables for the construction of monolithic boiler baffles, door linings and other general uses. They are smooth and flow easily, have high strength in small sections. Widely used to withstand temperatures as high as 2600 F.

B&W Insulating Concrete Mixes combine refractoriness, light weight and low heat conductivity with the ability to be poured like ordinary concrete. For temperatures up to 2200 F.

MORTARS—

B&W Mortars—Selecting the right mortar is vitally important to long refractory life. B&W Mortars pay for themselves by saving time in application and by satisfactorily performing their jobs under the designed furnace conditions.

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B&W REFRACTORIES PRODUCTS—B&W 80 Firebrick • B&W Junior Firebrick • B&W 80 Glass Tank Blocks • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars • OTHER B&W PRODUCTS—Stationary & Marine Boilers and Component Equipment... Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers . . . Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings

The Swift Sure Way to Remove SLUDGE and make it Pay!

HOUGHTO-SOLV

keeps fuel oil sludge in *permanent solution!*

THIS TEST SHOWS THAT HOUGHTO-SOLV DISSOLVES SLUDGE 10 TIMES FASTER!

Houghto-Solv completely dispersed sludge in 16 seconds in timed test.

Ordinary solvent tested *2 minutes* shows practically no results.

TRY SIMPLE TEST YOURSELF!

Ask for a sample and see how swiftly Houghto-Solv dissolves *your* sludge . . . or ask the Houghton man to demonstrate how you can *burn all the oil you buy* and eliminate costly cleaning jobs!

Add as little as *one quart* of Houghto-Solv to every 1000 gallons of fuel oil and your sludge problem is soon over! Your sludge deposit is dissolved in amazingly short order . . . kept in solution permanently . . . actually made burnable! So you not only utilize maximum BTU's, but also maintain a clean heating system and gain sizable savings in hard cash.

Upward of a billion gallons of fuel oil have been treated with Houghto-Solv. Records show savings as high as $2000. in one plant, in one application! In developing Houghto-Solv, Houghton research has come up with a fuel oil additive unsurpassed in performance. We urge you to try it, particularly if you use heavier fuel oils. You'll find it will pay to get full information promptly. Write to E. F. Houghton & Co., Philadelphia 33, Pa., for illustrated bulletin.

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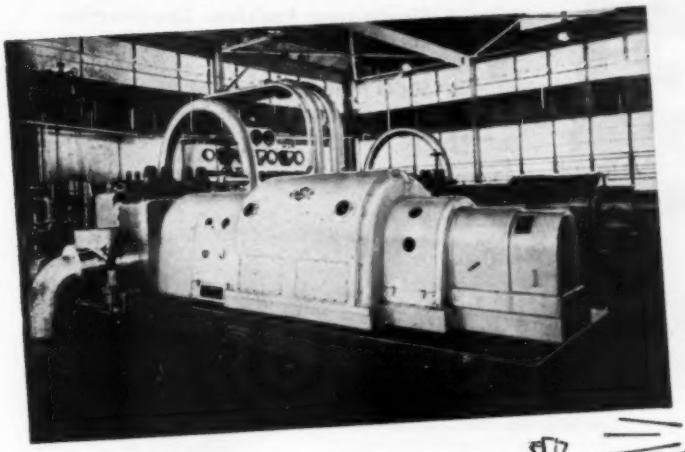
Ready to give you on-the-job service . . .

HANDLING TWO JOBS AT ONCE...

and saving money on both!



Two 1500 KW Worthington turbine-generators, installed in the Eunice, N. M. plant of the El Paso Natural Gas Company. These are non-condensing extraction turbines designed to operate on initial steam conditions of 575# — 575° FIT exhausting at 5#G back pressure.

Worthington Turbine-Generators Selected By Natural Gas Firm For Both Power and Product-Conditioning

Pumping natural gas from southeastern New Mexico and the Texas Panhandle to points in California and Arizona, the El Paso Natural Gas Company uses Worthington Turbine-Generators for double duty. Besides furnishing electricity for the company's plant in Eunice, N. M., the turbines automatically extract steam at 125#G for heating Amine solution, which is mixed with the gas to remove impurities.

In every branch of industry, users are getting daily proof of the outstanding flexibility of Worthington Turbine-Generator Sets — not only as sources of more dependable, more economical electric power, but as cost-cutting suppliers of processing steam for many important allied purposes.

WORTHINGTON TAKES ALL THE RESPONSIBILITY

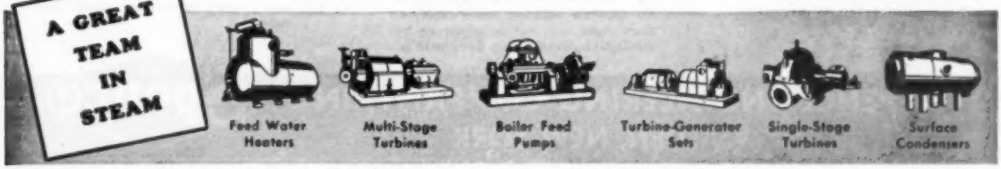
Worthington builds Turbine-Generator Sets in sizes up to 10,000 kw, and in all types. Each is designed to make steam do more work, and each is backed by Worthington's undivided responsibility for the complete unit's design, assembly and performance. For expert aid in selecting the *right* size and type for your own requirements . . . and further proof that *there's more worth in Worthington* . . call our nearest District Office. Or write to *Worthington Pump and Machinery Corporation, Steam Turbine Division, Wellsville, N. Y.*

WORTHINGTON

STEAM TURBINES

T-O-9

A GREAT TEAM IN STEAM



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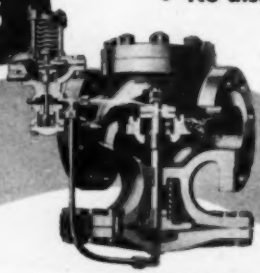
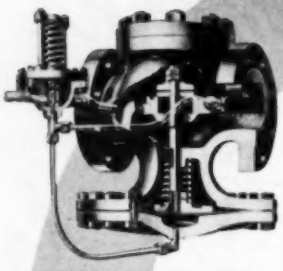
Here are a few reasons why Spence Regulators give you accurate regulation and long, trouble-free life:

- **Single-seat Packless Construction**
- **Large Balanced Metal Diaphragm**
- **Sensitive Pilots**
- **SECO Metal Seats and Discs**
- **Springs out of path of steam**
- **No dismantling for inspection**

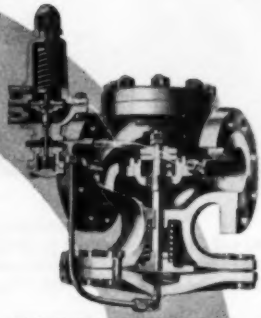


PRESSURE REDUCING—Self-operated, dead-end regulators powered by large, frictionless, metal diaphragms. Sizes ¼ in. to 12 in. Pressures to 600 psi 750 F.

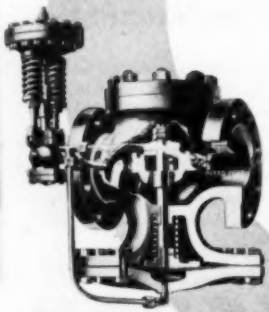


BACK PRESSURE CONTROL—Wide selection of sensitive pilots to meet exacting requirements. Initial pressure closing, guaranteed to shut tight. Packless construction, metal diaphragms.

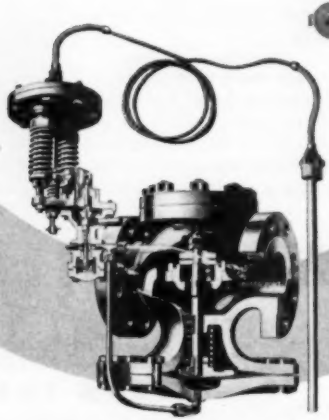
WRITE FOR BULLETIN 350
for complete details on Spence's line of automatic regulating valves



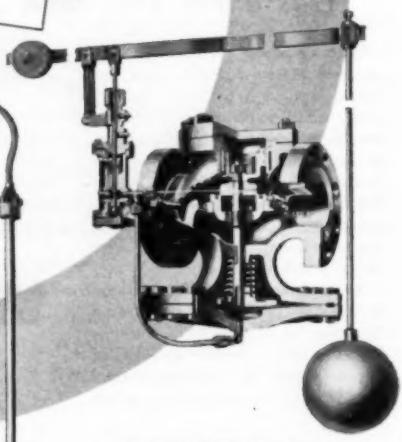
DIFFERENTIAL PRESSURE—Accurate control of delivery pressure at a constant, adjustable differential from 3 to 150 psi above another source of fluid pressure.



PUMP GOVERNOR—Constant or excess pressure control for steam pumps. Steam pressures to 600 psi 750 F, pump discharge pressures to 2000 psi.



TEMPERATURE REGULATING—Combined temperature and pressure control. No separate reducing valve required. Shuts tight, will not wiredraw or be damaged by overheating. Sizes to 12 in.



LEVER OPERATED—Pilot lever for connection by cable or mechanical linkage to floats or other devices. Slight actuator motion opens and closes main valve.

9K-11D

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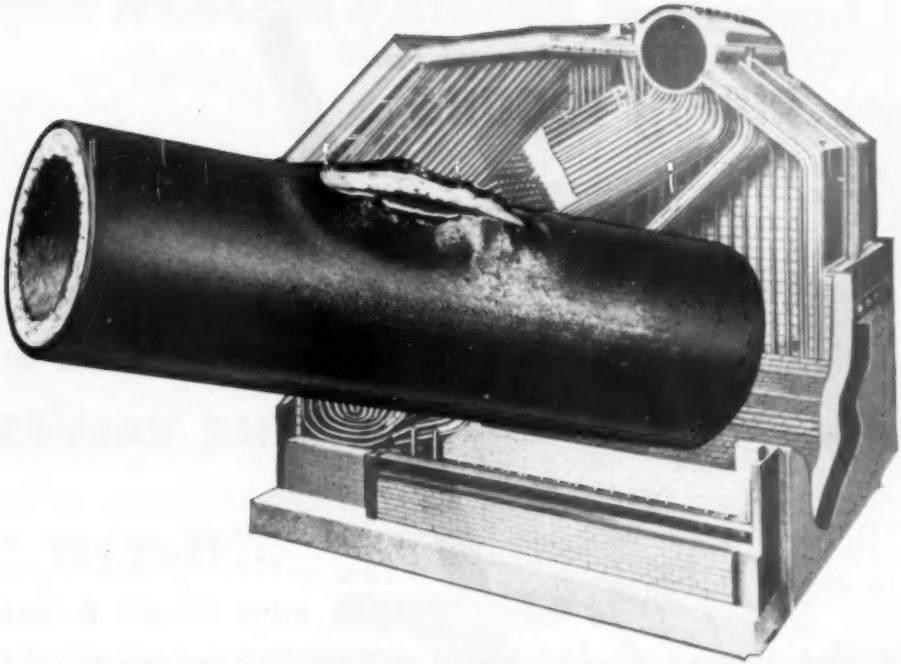

DON'T LET IMPROPER WATER TREATMENT SABOTAGE YOUR BOILERS

This year, the weakest link in your production program may be *one* boiler tube! The loss of that tube will slow vital production . . . will take longer to replace . . . will cost more.

Modern, up-to-date water conditioning, such as the Drew System, prevents tube failures. Drew's continuing research, its study and investigation of *your* operating and water conditioning problems in its laboratories makes such prevention possible. Drew *insures* the performance of your water conditioning by its dependable and frequent testing and checking service.

That's why Drew is one of America's fastest growing water treatment companies. Industry's most respected names avail themselves of Drew's specialized service. Do the same. Consult the nearest Drew engineer or write for further information.

Send for the new, illustrated DREW ORGANICS Folder describing the use of organics in modern Boiler Water Treatment. Write today.

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E. F. DREW & CO., INC.

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Nationwide Service in Boiler Water and Cooling Water Conditioning

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piping repairs *cost more* now!

No. 480 Iron Body Clamp Gate

You make them less often

by using Dependable Quality

CRANE VALVES

...That's why more Crane Valves are used than any other make

easy access prevents trouble with this valve

Remove just two nuts to dismantle this gate valve for inspection, cleaning, or repairs—without taking it from the line. Reassemble just as easily, knowing that Crane clamp design keeps the bonnet joint snug and accurately aligned. Use Crane Clamp Gates on steam, water, and air, but especially in heavy fluid lines needing periodic cleanout. They'll save time, labor, and encourage regular servicing that prevents valve trouble.

Combining easy access with highly dependable service features, Crane Clamp Gates typify Crane Quality—*better valve performance at lowest ultimate cost.*

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Small HEACON DAMPER Applications that Pay for Themselves...

Chart of 24 hour operation mentioned in text

Main Plant of the Passyunk Laundry Philadelphia, Penna.

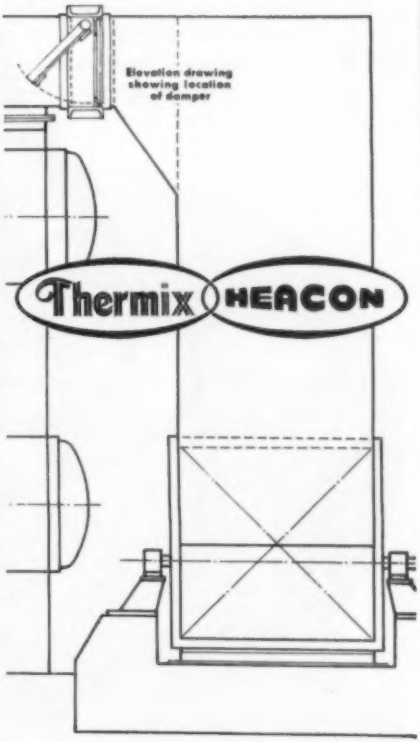
...IN FUEL SAVINGS
...IN REDUCING STARTING TIME LAG
...IN ELIMINATING ATTENDANT COSTS

A 200 H. P. Keeler Boiler supplies power for this modern laundry, operating an engine generator set, pressing machines, ironers and a hot water generator. A Heacon Type L H Damper, located in the duct connecting the outlet of the boiler to a P-D Fan Stack, was installed to maintain pressure during banking periods.

Prior to installation, the boiler was banked at 5:30 P.M., fired to 125 psig at 1:00 A.M. and at 6:30 A.M. available pressure for starting would average 30 psig. Since installation of the Heacon Damper, the oil burners are shut down at 4:45 P.M. and the damper closed. Steam demand is permitted to continue until 5:15 P.M. and the pressure has dropped to 55 psig when the stop valve is closed. This step is necessary to avoid lifting the safety valve. At 7:30 P.M. the residual heat in the setting has raised the pressure to 120 psig and a relief valve opens causing steam to flow to the water heater. This continues until 11:45 P.M. At 6 A.M. when the stop valve is opened, the boiler pressure is 109 psig. This sequence is illustrated by the pressure chart. The fuel saving is obviously considerable. In addition, the cost of a watchman to fire the boiler at 1:00 A.M. is saved and an automatic fire alarm system has reduced insurance rates.

Heacon Dampers are based on an entirely new principle. A Flexible curtain of asbestos conforms to the seals, forming a tight shut-off. This design also permits accurate control, either automatic or manual.

Your critical damper problems, large or small, can be solved by Heacon Dampers, at a cost that will pay for itself in six months. Our engineers will be glad to show you how Heacon Dampers can save you money.



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400° F.

350° F.

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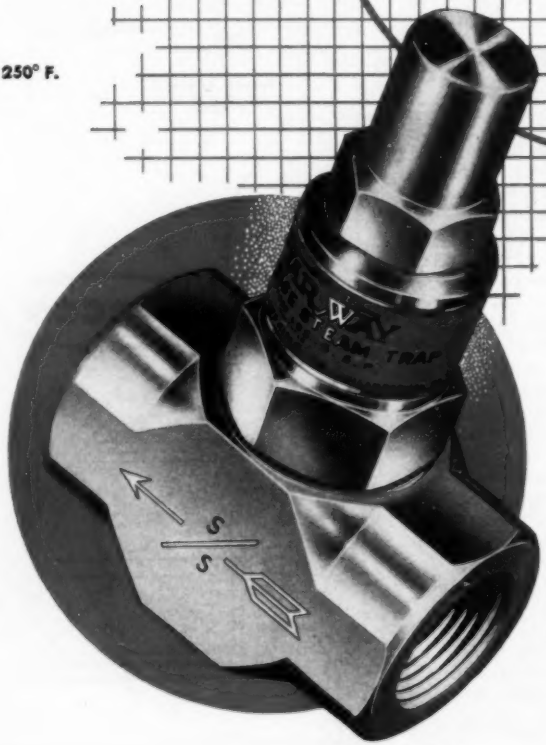
250° F.

FOR EVEN TEMPERATURES

YARWAY

STEAM TRAPS



● Processes requiring careful temperature control call for Yarway Impulse Steam Traps on steam equipment.

The reason! . . Yarway traps maintain even temperatures because they *continually* sample and respond to a trickle of the condensate. There is no arrest in flow, no waiting for large quantities of condensate to accumulate, or trapped steam pockets to condense.

Other reasons why Yarway Impulse Traps have become first choice in many thousands of plants:

- They get equipment hotter, sooner
- Small size, light weight
- Easy to install, easy to maintain
- Only one moving part
- Good for all pressures
- Stainless steel construction
- Low cost

If you are not already familiar with these and other advantages of the Yarway Impusle Steam Trap, try one *for free* and find out for yourself. Call your nearby Yarway distributor, or write to:

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YARWAY IMPULSE STEAM TRAP

INDUSTRIAL POWER

April, 1951 Vol. 60, No. 4

WILLMAR, MINN., INCREASES CAPACITY OF MUNICIPAL POWER AND HEATING PLANT

Fuel saving of 17.4 per cent has been obtained with steam and power generating equipment installed last year. Planned expansion, based on projected electrical load growth during next five years, requires still more steam-generating units

J. LIGHTOWLER, *Consulting Engineer, Pfeifer and Shultz, Engineers*
W. VAN TASSEL, *Superintendent, Willmar Water and Light Commission*

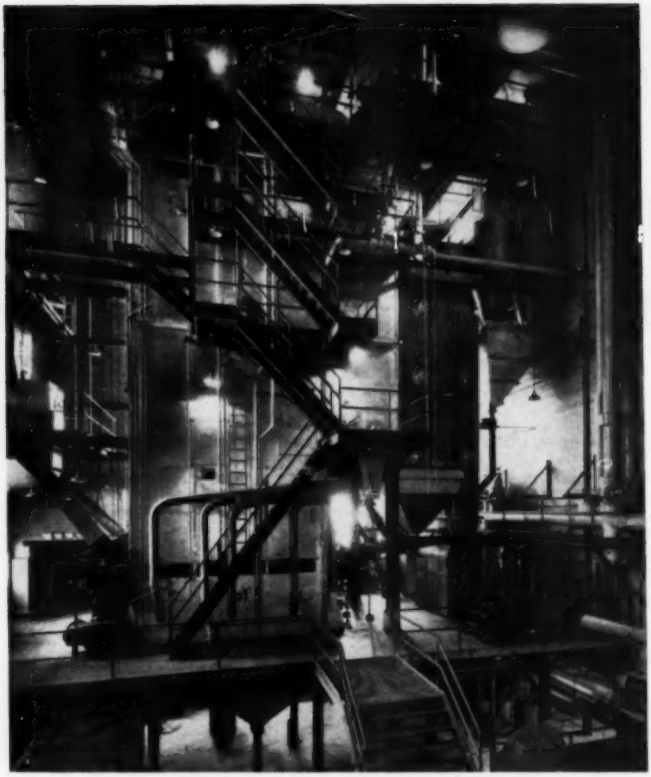
IN 1945, Willmar, Minn. employed a firm of consulting engineers to make a survey of the municipal power plant requirements, since it was apparent that the steam and electrical loads were growing beyond the capacity of existing equipment. This municipal plant experienced peak electric load of 600 kw in 1926, the first year of operation following construction of a completely new powerhouse. In 1949 the peak electrical load had reached 3,650 kw, with annual electrical generation exceeding 15 million kilowatt-hours.

Six years ago the boiler equipment included three watertube boilers, two of 400 hp capacity and one of 567 hp capacity, all fired by multiple-retort underfeed stokers and operated at 220 psig and 550 F total temperature. The electrical generating equipment included three turbine generating units of the automatic extraction condensing type and a 320-kw capacity steam-engine generating unit. The turbine generating units included a 750-kw, a 1000-kw and a 2000-kw turbine generator. The switchboard was of the electrically operated type with remote controlled 2400-v switchgear of modern design. The plant had a firm capacity of slightly over 2000 kw, and the peak load had reached 1720 kilowatts by 1944. The peak steam demand of the plant had reached 38,000 lb per hr, which was equal to the peak steaming capacity of the largest boiler.

Basic Plant Design

In planning the addition of steam and electrical generating capacity to this plant, the firm of Pfeifer and Schultz, consulting engineers, made a study of the growth of the steam and electrical loads. Resultant load growth curves were extended to provide a basis for predicting future load growth and sizing new equipment. By studying the preceding 20-year period, it was found that the annual generation had increased approximately 8 per per year cumulatively over the 20-year period. Studies of similar plants in the area indicated that this rate of

Two 600 ton coal-storage silos and a 40 ton per hr coal elevator were recently added to plant equipment. The smaller ash silo is topped by steam-jet exhauster that can be operated either on 400 or 220 psi steam



This view of Willmar's new boiler also shows the coal scale, air heater and ash collector. Erection of still another boiler has already started

growth was normal for municipally owned plants.

A similar study of heating system growth was made and this study revealed that the load was growing at a normal rate of 2 per cent per year cumulatively.

The resulting load growth curves served as a basis for predicting future growth and determining the loads to be served by the proposed plant extension. Planned expansion extending over several years was then devised.

A series of monthly average station heat balances were calculated to determine the most economical operating conditions; also, to determine the size of the steam and electric generating equipment. These heat balances indicated that the most economical operation, consistent with the capital expenditure required, would be provided by a plant operating at 400 psig 750 F total temperature. With modern firing equipment which would permit burning the cheapest fuels, and with modern steam generating equipment, it was indicated that fuel costs could be reduced approximately 25 per cent and still keep capital investments within limits that would permit profitable operation.

The turbine generating unit was set up to operate on a throttle pressure of 400 psig with full automatic extraction at from 2 to 20 psig and a back pressure of 1.5 in. of mercury absolute. A high-pressure uncontrolled extraction opening was specified to supply steam to the closed feedwater heater. Because of its flexibility and stability under adverse operating conditions, a four-drum steam generating unit was specified. A continuous ash discharge spreader-type stoker was selected to fire the unit, because of the adaptability of this type of firing to the variety of fuels economically available to this plant. These fuels include eastern bituminous coal available from the docks at Duluth, Minn., Illinois coals, and North Dakota lignite. For the wide range of fuels available to this plant, it was seen that a conservatively designed unit would be required. On this basis the furnace heat release was limited to 75,000 Btu per sq ft of projected black surface per hr, and the gas temperature entering the slag screen was limited to 1900 F at the continuous rating of the unit. With this design, slagging has not been experienced even under adverse operating conditions with the lowest-grade midwestern coals.

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Auxiliary Equipment

To provide rapid response to load changes and to obtain a high operating efficiency, a counterflow tubular air preheater was specified. Arrangements were made for automatic bypassing of air at low loads to protect the air-heater surface in the cold zone. To protect the stoker grate, the air temperature available at the stoker grate was limited to 350 F at the 2-hr peak rating. Other auxiliary equipment included a motor-driven induced-draft fan, a turbine-driven forced-draft fan, and a cyclone-type flyash eliminator. The flyash eliminator was necessitated in this plant because of its proximity to the business and residential district.

Raw water available for make-up for this plant was to come from city owned wells and was not suitable for use as boiler water without pre-treatment. In order to properly design the feedwater treating system, the services of Sheppard T. Powell, consulting chemical engineer, were retained. Mr. Powell's recommendations included a hot-process lime-soda softener with integral condensate, and make-up deaerators and a feedwater storage compartment. The secondary feedwater treating equipment consisted of phosphate and sulphite mixing and pumping equipment of standard design.

Coal-Handling Facilities

The location of the plant in the center of town necessarily limited the coal storage space on the plant property. To assist in overcoming the shortage of coal storage area, two 600-ton capacity glazed tile silos, each fitted with a 50-ton live storage shelf, were erected adjacent to the power plant building. A 40 ton per hr capacity

bucket elevator, fed from a track hopper by a reciprocating plate feeder and from the silo reclaim shelves by rotary vane feeders, serves the silo live storage shelves. One silo is arranged to serve the new boiler through a bulk flow type of conveyer, a surge hopper, and an automatic coal scale. The other silo serves mainly as coal storage space; however, it is also arranged to provide coal directly to the stokers on the stand-by boilers. A short reinforced concrete tunnel connects the boiler room basement with the pit housing the elevator boot and the reciprocating feeder, thus making maintenance and operation as easy as possible.

Pneumatic Ash Disposal

A pneumatic ash-conveyer system was installed to serve both the old and the new boilers with dustless dry-ash removal. The pneumatic ash conveyer terminates in a tile ash silo, arranged for unloading into trucks. One electric driven and one steam turbine driven boiler feedpump are located in the boiler-room basement, and take their suctions from the storage compartment of the hot-process softener, and discharge into the boiler feedwater header. Either pump is adequate to serve the requirements of the present boiler, and space is provided for an additional pump.

An automatic pressure-reducing and desuperheating station was installed to interconnect the 400-psig 750-F system and the 220-psig, 550-F system. With this pressure-reducing and desuperheating station, it is possible to operate the lower-pressure turbine generators from the 400-psig boiler; however, this is done only when the new turbine is out of service for inspection or maintenance.

Two air compressors for combustion control air and for general use are installed in the boiler-room basement.

Power Generating Equipment

In the turbine room directly behind the boiler, the new 4000-kw turbine generator was installed. The turbine foundation is a four-legged reinforced concrete structure with a steel frame inserted. This foundation design allows sufficient headroom around the turbine and condenser for maintenance purposes. The 7000 sq ft surface condenser was hung from the turbine exhaust flange to eliminate the expansion joint normally employed. The hotwell pumps and the gland-seal pump were mounted on the basement floor near the hotwell, and the air ejector was mounted on the operating floor adjacent to the turbine.

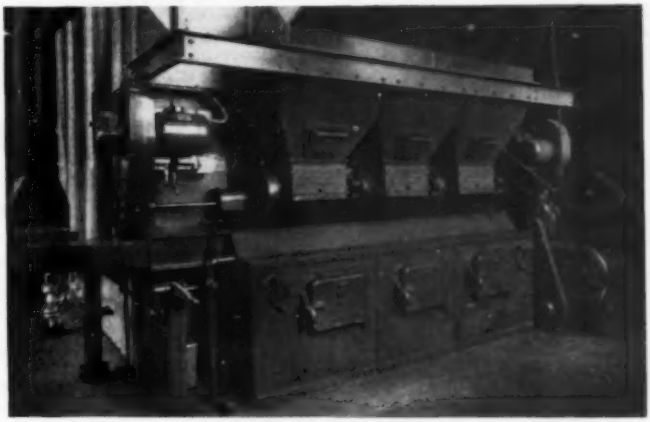
Condensing water is circulated through the condenser by pumps located in a combination pipe tunnel and

• In 1895 when Willmar, Minn., was a town of 2500 population, the municipally owned light plant was established. Facilities were expanded in 1914, supplying steam for a heating system constructed to serve office buildings in the downtown business area.

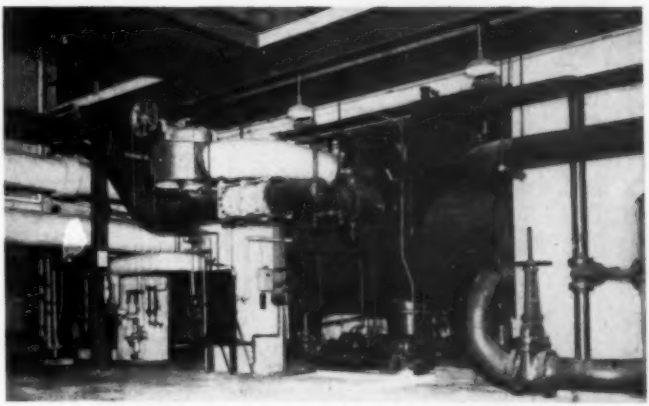
A new power plant at a new location was built in 1925, at which time the first turbine generator was installed. Annual power load at that time was 1,850,000 kwh. During the intervening years, three more generators were added, the last in 1949 when the power demand had increased to 15,000,000 kwh.

Other improvements were made a year ago. During the first year of operation of the new equipment, total electrical generation increased almost 20 per cent, while fuel consumption chargeable to generation increased only 3.6 per cent. Compared to the previous year, annual plant fuel costs decreased 17.4 per cent. Improvements that effected this saving are described in this article.

It is planned to install additional steam generating equipment, which will be used for the next five year or more as base load equipment during five months of the year, and stand-by during the other seven months. This arrangement will give the operators 100 per cent stand-by steam capacity.



Front view of the 400-psi 750-F boiler. Dual motor drive on spreader stoker has one motor connected to 480-v bank, the other to 240-v bank



Large geared multiport relief valve in exhaust line to the condenser controls extraction steam to the district heating system. The 24-in. insulated piping at the left is part of low-pressure heating system

pump room at the basement floor level under the sidewalk in front of the plant. The pump room and piping are designed for the addition of future equipment to serve up to 10,000 kw of generating capacity which limit is established by the space available for cooling towers. Two sizes of pumps were installed to permit economical operation at various load levels.

The cooling towers were erected on property adjacent to the power plant and were designed to cool 5200 gpm of condensing water at 95 to 80 F with a wet-bulb temperature of 74 F. The tower sections and piping leading to and from the towers were arranged to permit the addition of sections for an ultimate capacity of 13,000 gpm of condensing water. The cooling tower fans were equipped with two-speed motor drives to permit reduced speed operation during cold weather. Remote control stations were installed in the turbine room for starting and stopping the cooling tower fans.

The power plant building addition was arranged to provide space for the next steam generating unit, and the next turbine generating unit, without the necessity of additional building construction when those units are installed. Only a small amount of temporary wall was required, and this need not be removed until the old 220-psig boilers are removed and the rebuilding of that end of the plant is required.

Heating System

A reinforced concrete tunnel was constructed to connect the power plant building with the existing heating tunnel, thus replacing buried steam and return mains adjacent to the power plant. A new duplex vacuum pump of 300,000 sq ft E.D.R. capacity was installed to replace old steam-driven reciprocating vacuum pumps which were obsolete. Heating main extensions were made to serve additional customers, and a plan was set up for future additions and alterations to enable the system to operate with not more than 3-psig pressure drop with an initial pressure of 5 psig at the turbine extraction opening. At present the heating system consists mainly of walk-through tunnels; however, the recent extensions have been made using buried lines remote from the power plant.

Plant Operating Economy

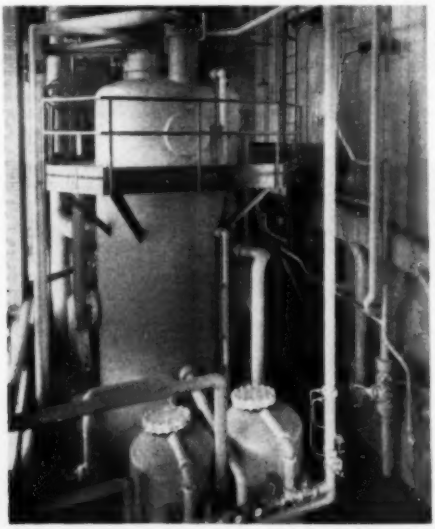
A comparison of operating costs for the year prior to operation of the new equipment, and the first year of operation of the new equipment, indicates that while total electrical generation increased 2,453,900 kwh, a 19.1 per cent increase, the fuel consumption chargeable to generation increased only 424 ton, or 3.6 per cent. Fuel consumption chargeable to steam heating decreased 237 ton (partly due to improvements in the heating system maintenance), even though heating steam sales were increased at the same time.

The annual plant fuel cost decreased more than $31,000, representing a saving of 17.4 per cent over the previous year, despite increased annual electrical generation and heating steam production. If the increased loads had been carried on the old equipment, fuel costs alone would have been 30 per cent in excess of those experienced with the new equipment.

Future Plans

While the plant extension was being planned and constructed, loads stepped up sharply, and it is now apparent that additional steam generating capacity will be required within the next two to three years. Electrical generating capacity, however, need not be increased immediately, since the present 2000-kw turbine generator is suitable for operation at 400 psig and 750 F with only slight modifications.

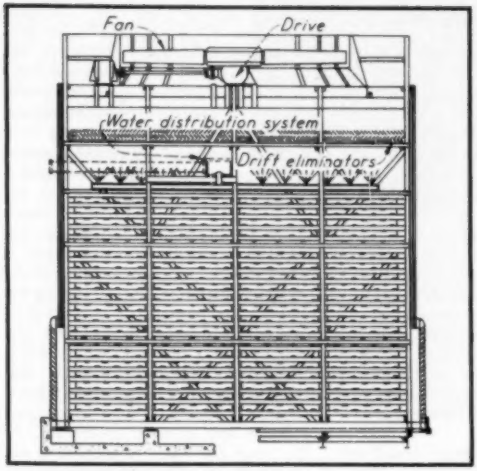
The load growth of this plant during the past five years has been extremely high due to new housing construction, new industry, and a mutual assistance contract with the public utility serving the area around the city. Earnings of the plant since it was placed in operation justify additional expenditures for larger steam generating equipment to serve the increased loads which may be expected to continue increasing at a considerably higher rate for at least the next two or three years.



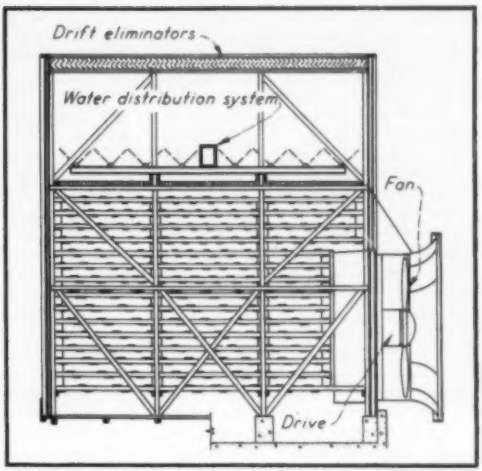
Feedwater heater and deaerator recently installed operates at one-third of capacity, and will service new boilers soon to be installed. Careful control of condensate losses in the district heating system keeps water make-up requirements below 4 per cent

PRINCIPAL EQUIPMENT AT WILLMAR, MINN., POWER PLANT

Steam generating unit	The Babcock & Wilcox Co.
Firing equipment	Detroit Stoker Co.
Sectionally supported setting	Bigelow-Liptak Corp.
Soot blowers	Diamond Power Specialty Corp.
Water column equipment	Diamond Power Specialty Corp.
Safety valves	Manning, Maxwell & Moore, Inc.
Blowoff valves	The Lunkenheimer Co.
Feedwater regulator	Northern Equipment Co.
Combustion controls and meters	Bailey Meter Co
Flyash eliminator	Buell Engineering Corp.
Forced- and induced-draft fans	Clarage Fan Co.
Forced-draft fan turbine	Elliott Co.
Coal-handling equipment	Fairfield Engineering Co.
Coal conveyor	Stephens-Adamson Co.
Coal scales and distributor	Richardson Scale Co.
Ash-handling equipment	United Conveyor Corp.
Primary reducing and desuperheating equipment	Bailey Meter Co.
Primary water-treating equipment	Permutit Co.
Secondary water-treatment pumps	Proportioneers, Inc.
Boiler feedpumps	Allis-Chalmers Mfg. Co.
Boiler feedpump turbine	General Electric Co.
Closed feedwater heater	Westinghouse Electric Corp.
Vacuum pumps	The Skidmore Corp.
Turbine generator	General Electric Co.
Surface condenser	Allis-Chalmers Mfg. Co.
Condensate pumps	Allis-Chalmers Mfg. Co.
Circulating water pumps	Allis-Chalmers Mfg. Co.
Cooling towers	The Marley Co.
Air compressors	Ingersoll-Rand Co.
Continuous blowdown equipment	Cochrane Corp.
Desuperheater water pump	Ingersoll-Rand Co.
Turbine panel board	Bailey Meter Co.
Oil and air temperature alarms	Bailey Meter Co.
Switchgear	Westinghouse Electric Corp.
Turbine-room crane	Whiting Corp.
Sump pump	Gould Pumps, Inc.
Relief valves	Cochrane Corp.
Expansion joints	Jos. Kopperman and Sons
Pipe covering and insulation	Armstrong Cork Co.
Steel valves	The Lunkenheimer Co.
Freight elevator	Gust Lagerquist and Sons



Counterflow induced-draft towers contain one or more fans located in the outlet. Air enters on the sides near bottom



Forced-draft cooling towers have one or more fans located at air entrance. Air inlet is at bottom, discharge at top

THE PROPER WATER TOWER MEANS WATER CONSERVATION

Concluding article of this series gives helpful hints on what to look for when selecting water cooling towers. Variables that effect performance are stressed along with sizing for sufficient capacity

HOWARD E. DEGLER, *Technical Director*
The Marley Company, Inc.

LOWEST TEMPERATURE to which water may be cooled in cooling towers is the temperature of adiabatic saturation — the wet-bulb temperature of the ambient air. Performance is measured in terms of "approach" of cold-water temperature to the air wet-bulb temperature when cooling the water through some desired "range." For a definite heat load, the approach to be obtained would depend largely upon the geographical location (design wet-bulb), the range and the type of water-cooling equipment. A close approach requires a larger and more expensive tower than a long approach. For example, the cost of a tower for a 5 F approach would be 1½ to 2 times that of a unit for a 10 F approach with a given heat load.

Before the characteristics of a specific water-cooling apparatus can be judged desirable or undesirable for a given heat load and wet-bulb temperature, a survey should consider the importance of each of the following items: first cost including all necessary auxiliaries, area, height, weight, effect of wind velocity and direction, rigidity of structure to withstand high winds, safety, conformity to building codes, drift nuisance, make-up water requirements and cost of chemical treatment if needed, total power for pumping (plus fan operation in the case of mechanical draft), maintenance, available locations (with due thought to possible future expansion, wind restrictions, space cost, proximity and accessibility), appearance, the equipment's operating flexibility for the most economical conformance to varying loads or seasonal changes, and other considerations occurring with specific applications.

For a definite heat-load dissipation, the type and size of a water-cooling tower is primarily affected by the following conditions: (1) gallons per minute of cooling water, (2) geographical location, (3) wet-bulb design temperature of ambient air, (4) temperature of hot water entering tower at normal rating, (5) temperature of cold water leaving tower at normal rating, (6) ground, roof or sub-structure installation, (7) area available for cooling tower, (8) proximity to other structures, (9) surface of water exposed to each unit quantity of air and (10) time of air contact with the water. This depends upon height (or length) of the tower and relative velocity of air and water.

The selection of a proper water-cooling range depends upon: (1) type of service, (2) wet-bulb air temperature at which the equipment must operate and (3) type employed.

Because of the many variables in water-cooling tower calculations and performance, it is difficult to provide simple handbook equations and tables whereby an engineer can readily select the type and size of unit for a definite requirement. Each manufacturer has a semi-confidential method of sizing a tower, based largely upon research and actual performance correlated with definite requirements. Selection of water-cooling equipment for any specified service must ultimately depend upon overall considerations established from reliable design and performance data.

Some of the variables encountered in water-cooling tower work are: (1) changing air and water temperatures throughout the structure, (2) varying moisture content, pressure and volume of the moving air and (3) caprice of the weather, ambient air changes in temperature, humidity, wind velocity and direction, and the amount of sunshine. Other less important physical properties of the air and water affecting tower performance are: density, specific heat, conductivity, viscosity, vapor pressure, surface tension, latent heat, coefficient of expansion, vapor diffusivity and molecular weight.

Air velocity, overall and in different parts of the tower, is an important heat-transfer factor along with type of air movement provided, whether it be of the natural draft, forced draft, induced draft, counterflow or crossflow design. Different details of construction will produce dissimilar velocities of water, distribution and diffusion, size of the drops, jets, sprays and sheets as affected by the pressure and elevation of the water-supply system, as well as the absorption and interfacial surface tension of the wetted areas.

Dissolved gases and other impurities in the water influence the water-cooling process. Additional cooling tower variables affecting this performance include: (1) location—ground, roof, nearby obstructions, wind orientation, —dimensions, relative proportions—contour—of tower structure, materials, type and arrangement of interior surfaces; (2) louver and drift-eliminator designs as they facilitate air flow to and from the tower; and (3) temperature of the structure at different points as influenced by external and internal conditions.

Other cooling tower factors to be considered are: loss of water by entrainment (drift loss), design and location of water-collecting basin, and surface evaporation therefrom; also, the noise generated by air, water and fan, as well as structure vibration.

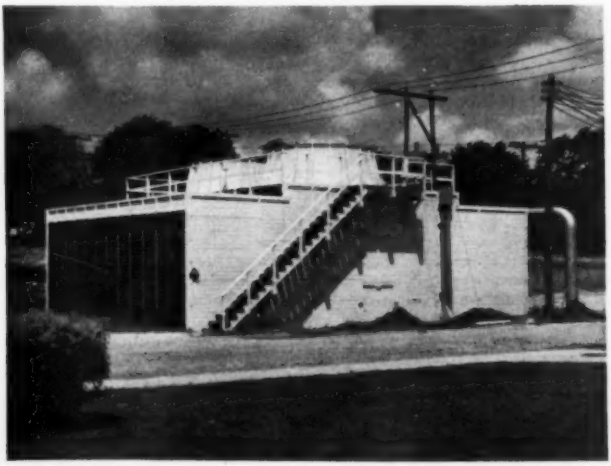
Basically, a water-cooling tower is a heat exchanger in which heat flows from the water to the air by (1) a flow of sensible heat from the warm water to the cooler air and (2) an exchange of latent heat resulting from evaporation of a small part of circulating water to increase the humidity ratio of the air by a corresponding amount. The general principles involved are similar to those encountered in the processes of diffusion in absorption and extraction equipment.

Water-cooling equipment should not be purchased on a low-cost basis alone, but for an assured continuously satisfactory performance for the service required. This desire necessitates adequate capacity for all correlated processes. High pressures (and temperatures) frequently result in unsatisfactory and expensive operation. Sufficient water-cooling capacity will assure low operating temperatures and good performance.

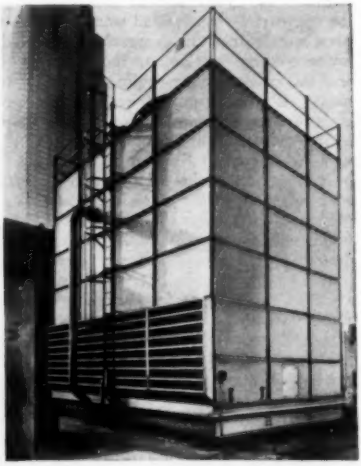
To formulate any set of recommendations that would definitely establish a given water-cooling method as the most suitable for any particular installation is impossible. In general, the cost of water-cooling equipment is justifiable in most cases where water is being purchased, and the saving becomes more pronounced as cooling requirements increase. Anticipated performance of a proposed water-cooling installation must be completely analyzed, and the final selection frequently becomes a matter of engineering compromise and personal preference. As the need for water conservation has increased, the manufacturers of water-cooling equipment are accumulating a great reservoir of experience through specialized applications.

TABLE 1—COMPARATIVE COSTS OF WATER-COOLING TOWERS—1925 TO 1950

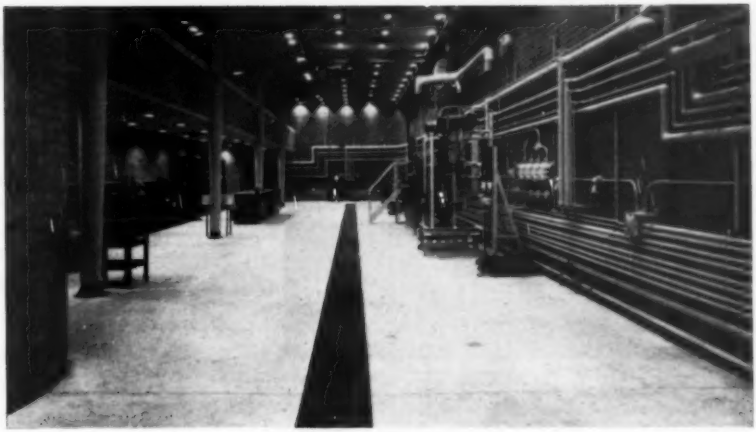
	5000 gpm				25,000 gpm			
	1925	1932	1941	1950	1925	1932	1941	1950
Base, ft	22x95	30x72	30x80	36x48	36x220	26x240	40x240	60x90
Height, ft	40	36	26	20	40	36	26	26
Area, sq ft	2112	2160	2400	1730	8420	8640	9600	5400
Fans, number	6	6	4	2	22	24	10	3
Size	11	11	13	14	12	11	16	18
Bhp, each	28.4	19.2	24	21	30	19.2	38.4	60
Bhp, total	170.4	114.9	96	42	660	460.8	384.0	180
Dry weight, lb	280,000	260,000	240,000	105,000	960,000	940,000	900,000	440,000
Pump head, ft	27	27	20	14	28	28	20	20
Total cost	$22,000	$20,000	$19,000	$19,500	$78,000	$71,000	$67,000	$40,000



Double-flow water-cooling tower has a low pumping head, better air to water contact, greater operating efficiency and gives a lower water temperature



Conventional induced-draft counterflow unit has a high outlet velocity air discharge



Cleanliness is the password in this well-lighted and air-conditioned laboratory. Piping for water, compressed air, electrical, steam and fume exhaust has been given a functional colored coating of paint for ease of identification

PILOT LAB AT JOHNSON WAX OUTLAWS GUESSWORK AT PRODUCTION LINE

Modern and up-to-date in every respect this laboratory has miniature processing equipment that can duplicate large-scale production

THE PILOT PLANT of S. C. Johnson & Son, Inc. at Racine, Wis., is completely modern and spacious, and is an amazing contrast to the crowded and congested area, previously used by this department. This unit houses the experimental engineering department of the research and development division.

It makes available a multitude of facilities for planning, developing and testing wax-production processes. When new wax products or new formulations are developed by research and development chemists, this experimental engineering unit works out mass-production methods.

Contained in the pilot plant is small-scale equipment which can duplicate at will almost every manufacturing set-up in the plant. But because of the experimental type of work accomplished and the many unknown factors that have to be determined before a wax product is ready for full production, there is quite a bit of additional equipment.

Included are several kettles varying in size from 10 to 40 gal, filters, coolers, homogenizers, pumps and equipment essential to wax manufacturing, all of which is designed and arranged for maximum flexibility. Utilities, such as gas, steam, compressed air, vacuum and electricity at different voltages are supplied throughout for quick and easy use. A chemical laboratory bench and a mechanical work bench for simple mechanical repairs round out the highly diversified facilities.

The building is completely air-conditioned, and 20 outlets in the ceiling supply air at the rate of 8,880 cfm. This allows for a complete change of air every 8 min. In addition, an exhaust fan in the ceiling is fitted with flexible tubes. These exhaust intakes can be placed over equipment to draw off any excessive fumes not satisfactorily dissipated by the air-conditioning system.

An electrically operated hoist for moving equipment and large drums runs on a monorail for almost the entire length of the building. With a pushbutton operated, one-ton lifting mechanism, the hoist serves an area about 20x90 ft.

Fire-protection equipment is the most modern that could be installed. It includes a carbon-dioxide system with outlets in the ceiling that would flood the entire working area with fire-quenching CO_2 vapor in a matter of seconds. This equipment will operate automatically when the temperature in the building rises above a certain point. Manual operation is possible by means of an easily accessible switch. A water-sprinkler system is included that is automatically controlled. In addition, six portable carbon-dioxide fire extinguishers and two fire hoses equipped with fog nozzles are available in the general work area, and another set is placed just outside the work area door.

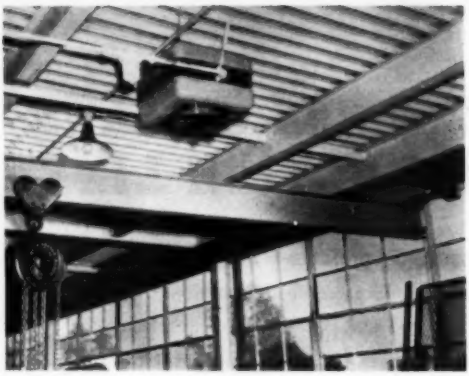
All of the equipment in the main work area, even the clock, is explosion proof. An added precaution is a safety shower located in the work area. Manually operated by a handy pull chain, it is easily and quickly accessible to any worker when necessary.

The concrete floor of the pilot plant is split by an 18 in. wide draining channel covered with an iron grating. The floor is pitched slightly so any waste or spilled liquids will run into the drain trough, which connects to a collection and separation basin and sewer. The trench allows easy cleaning, so desirable for good housekeeping.

In the balcony overlooking the pilot plant floors are the offices of the experimental engineering department. Ceiling high glass partitions separate the offices from the work area. Overall length of the pilot plant is 110 ft, width is 32 ft and the height is 19 ft. There are 3350 sq ft in the general working area and 574 sq ft in the balcony office space.

UNIT HEATERS . . . .

- Lower initial costs because of fewer valves, traps and connections required
- Finned radiation of 100 lb is equivalent to a ton of cast-iron or pipe radiation
- Applicable for numerous installations such as monitor-type roofs, sawtooth roofs and large storage or work areas
- Adaptable for manual or automatic operation with on-off or modulated control



Horizontal type discharge unit heater, at top, distributes heated air parallel with the ceiling to blanket downdrafts that might occur from skylights or overhead cold spots

Vertical-downblast type of unit heater, left, can be utilized satisfactorily to heat spaces under high ceilings as well as large floor areas where few obstructions occur

COMMERCIAL and industrial building heating with unit heaters presents a number of advantages not available in other heating systems. Because they have large heating capacities concentrated in a small space, coupled with air movement, they are able to heat large areas faster than any other heating surface.

Unit heaters have proved themselves, and a great majority of new industrial and commercial plants are installing them in preference to other heating methods. Many older plants with old-style heating systems are also changing over. The speedy response to heat demands, caused by changes in outside temperatures, is particularly important to maintaining comfortable conditions in industrial plants, and where there is frequent traffic between the outside and inside of the building. Temperature control is achieved by the use of simple thermostatic or manual controls.

Initial costs are low because fewer valves, traps and connections are required. A unit heater weighing approximately 100 lb has a heating capacity equivalent to more than a ton of cast-iron radiating surface or pipe coil. Fuel costs are proportional to heat distribution. Units furnish heat to specific areas and overheating and excessive fuel costs are eliminated. A close correlation can be provided between performance and requirements with a subsequent fuel savings.

When unit heaters replace less efficient methods of heat distribution, it is a case of modernizing for profit and not modernizing for the sake of modernizing. General experience has shown that fuel savings alone pay for such a system in two to three years.

Since plant layouts are often changed and new machines added, a new heat distributing pattern may be required, and the cost of future alterations must be seriously considered when the proper initial system is selected. Here the unit heater offers great advantages because heat distribution patterns can easily be reconstructed to meet alterations. In addition, unit heaters do not occupy any floor space.

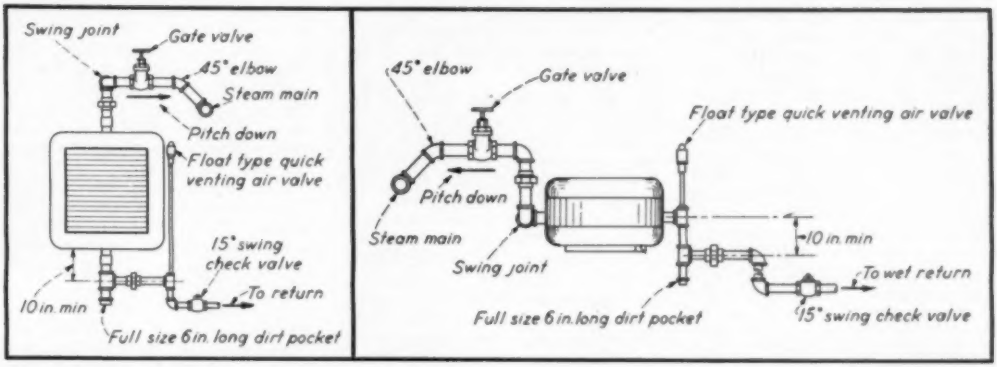
When a Cleveland plant was expanded the entire heating system was revised. Fifty-six units with automatic temperature controls were installed. These units heat the original building and an additional area at the same operating cost of the original system. The maintenance superintendent reports that even though there is a 25 per cent greater area being heated, only 350 boiler horsepower is now used as against the original 460. Furthermore, every part of the plant and office is uniformly heated, and hot and cold spots have been eliminated.

In a New York plant, 25,000 ft of pipe coils, 200 radiators and 500 valves were replaced with 29 unit heaters, valves and heavy-duty traps. The old heating system required approximately 300,000 gal of fuel oil per year. The first year following the new installation only 182,000 gal were burned. Thus a considerable saving was achieved with increased efficiency.

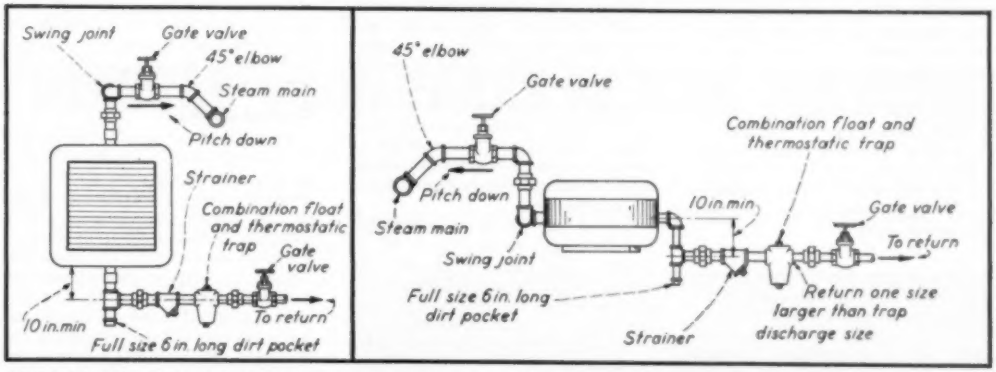
At Columbus, Georgia, the heating fuel costs of a textile mill were $15,500 a year. After installing unit heaters with proper temperature control, this fuel bill was reduced to $4,500 per year; a total reduction of 71 per cent.

In order to provide the greatest possible physical comfort, a unit heater system should consist of a number of well-distributed units. They should be

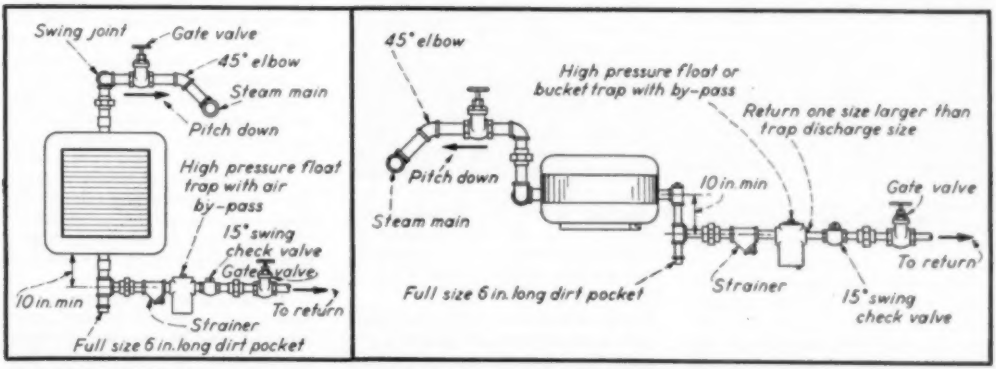
. . . .AND HOW THEY ARE APPLIED



LOW-PRESSURE GRAVITY steam piping system hook-up for vertical and horizontal positioned unit heaters. These items characteristic of both systems are: sloping steam main connection, venting air valve and check valve on outlet



VAPOR OR VACUUM STEAM HOOK-UP varies from the low pressure system in that the vent is not necessary. However, a combination steam trap should be installed in the discharge line that is protected with a suitable strainer



HIGH-PRESSURE SYSTEM, operating on 30 to 150 psig, has piping and auxiliaries in this arrangement. Traps can be either high-pressure float or bucket with air by-pass. Isolating heating equipment with unions is good practice

so arranged that air flow from one heater will support the air flow from another. Wherever possible, the warm air flow should parallel a cold wall so the cold air film is not disturbed. This would increase the heat loss rate through glass and walls. Units should be selected that have a combined heating capacity equal to space losses.

Mounting height is usually determined by job conditions. These factors are inlet air temperature at the mounting height, steam pressure available and outlet velocity. The choice of unit and type of diffuser is made from these factors. Units never should be installed higher than the maximum mounting height recommended by the manufacturer except in those rooms where the space below the floor is heated. In such instances, 1 or 2 ft may be added to the maximum mounting height. For efficient performance, unit heaters should be installed with the back or side of the unit not less than 3 ft from the wall.

In rooms having ceiling heights of less than 20 ft, horizontal discharge units are usually more suitable, providing there are no obstructions to prevent free movement of heated air. In rooms with obstructions or high ceilings, vertical discharge units are more practical. Depending upon the particular application, it may be necessary to use both horizontal and vertical units.

Steam systems most commonly used are: (1) vacuum, (2) two-pipe gravity, (3) high pressure and (4) two-pipe gravity open.

Vacuum System - Low Pressure — In the low-pressure vacuum system, condensate and air are removed from the heater through the return main by means of a mechanically operated vacuum pump. The air is discharged to the atmosphere; the condensate to the boiler. Because of the extremely close temperature range between the steam and condensate, a bucket or float-type trap is installed for condensate removal. A thermostatic trap is utilized for air removal.

Two-Pipe Gravity Closed System - Low Pressure—In the closed two-pipe gravity system there is a definite steam pressure in the return main. This pressure—together with the static head between the return main and the boiler water line—returns condensate to the boiler without mechanical means.

The return connection of the unit is usually controlled by check and gate valves. The air valve is installed between the check valve and the unit for automatic removal of air. Air should never be discharged from heaters into the return mains.

High-Pressure System — The high-pressure system usually operates with a steam pressure of 20 psi or more. The air is vented through a hand-operated petcock. Condensate flows through a high-pressure float or bucket trap to the return main and is discharged into a hotwell or into a boiler return trap—never directly from the unit to the boiler.

Two-Pipe Gravity Open System — In this system, no pressure is maintained in the return main. The condensate flows by gravity to the pump, receiver or hotwell, and it is discharged to the boiler mechanically.

On low-pressure steam systems, air is removed either by automatic air valves, such as on the gravity system, or through thermostatic traps, as on the vacuum system—except that an open vent is installed on the return main. To eliminate any steam pressure in the return main, condensate is controlled by a float or bucket trap.

Sawtooth Roofs — The principal problem in this type of installation is to maintain uniform temperature over the entire floor area without hot and cold spots. For example, in a room with a 15 ft ceiling height, where the vertical sides of the roof are largely glass, small downblast units should be selected equal to the calculated roof heating load. These units should be suspended about 1 ft from the ceiling. A spreader device should be placed under each heater.

Cold air from the roof will be heated and discharged horizontally in all directions. This warm air blankets the roof area and stops cold downdrafts. Temperature control maintains uniform heat. Irregular floor temperatures are avoided since hot air is not blown into the working area.

Horizontal-discharge unit heaters should also be installed around the outside walls. These units should have sufficient capacity to off set wall, floor and infiltration losses. All outside doors should be blanketed by streams of warm air.

Monitor Type Roofs—Industrial buildings with this type of roof construction usually have high bays. Downblast unit heaters should be installed to blanket the roof and skylights of the monitor. In such an application, downblast unit heaters are employed for the sole purpose of handling the heat loss in the monitor; they are not intended to heat the lower part of the building.

Storage Warehouses — Low temperatures in warehouses are caused by absorption of heat by materials moved from the outside to the inside. Consideration must be given to all stored heat-absorbing materials if a given warehouse temperature is to be held.

To estimate the heat absorbing capacity of material, two temperatures must be determined—that of the material when it enters the warehouse and the temperature to be maintained within the warehouse. The temperature difference is then calculated. The weight of the material being moved into the warehouse is generally known. The Btu's required to heat the material is obtained by multiplying the material weight by its specific heat and temperature difference.

In many warehouses, this load may exceed the normal heat losses of the building. To avoid heating all stored material at one time, portions of it may be covered or shielded by movable partitions.

For maximum comfort and highest operating efficiency, unit-heater systems should be automatically controlled. The method used determines the flexibility of the unit-heater system. Certain areas of a building can be controlled as a single zone, making it possible to shut down the heat in a particular area when the area is not in use. In the same manner, any zone can be heated for overtime or night shifts without heating the entire building.

Control Methods

Modulating and on-off controls are the two most efficient systems. Modulating control is the more effective of the two because it allows the unit heater fan to operate continuously while throttling the heater steam supply.

On-off control stops and starts the fan or heat supply in response to changes in area temperature. The fan is started by a thermostat. A pressurestat in the steam line or an aquastat on the return line is usually installed. As a result, the fan runs only when there is steam in the main.

Modulating control provides a constant discharge temperature, thus eliminating intermittent blasts of hot air. The continuous circulation prevents air stratification, which would otherwise be present when the fan is off. However, this method is best when the unit heaters are located 10 ft or more above the floor level. For installation less than 10 ft high it may cause drafts.

Modulating control may be accomplished by a proportioning valve in the steam line operated by a thermostat. The fans may be run constantly or may be switched off manually when no heat is required.

In order to be sure of having unit heaters that do the job required, units selected should be those that are rated in accordance with the standard test code adopted by the Industrial Unit Heater Association and the ASH&VE.

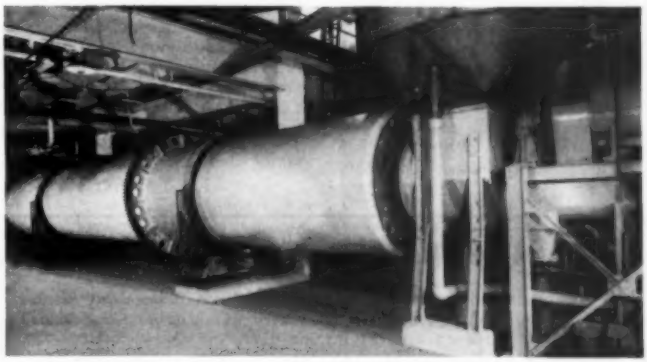
Stainless-steel sheets cover ½-in. insulation secured to vertical sides of the brewers with galvanized metal bands

MINERAL WOOL TAKES ON NEW BREWERY

Engineered insulation of tanks, tuns, cookers and driers throughout this plant with mineral wool have effected a saving in process steam

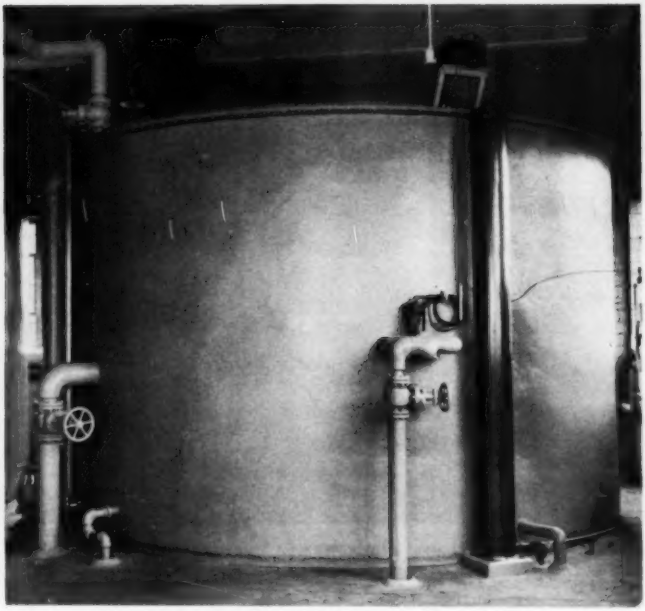
MINERAL WOOL insulation on hot-water tanks, cereal cookers, mash tuns, Lauter tuns, brewing kettles and grain driers conserves fuel and maintains stable process temperatures in the modern eleven-floor brewhouse at the Duquesne Brewing Co., Pittsburgh, Pa. The insulating techniques applied were developed to produce a long-lasting installation with virtually no maintenance. Installations such as these—because they are skillfully planned and executed—take maximum advantage of the insulating properties of mineral wool and thereby contribute directly to reliable and effective insulation.

Three cylindrical tanks on the sixth floor and five on the fifth floor contain hot filtered water for distribution to the brewing units on the floors below. Each of these tanks contains 500 bbl of water at about 200 F. To maintain water at this temperature, 1½-in. thick mineral wool board insulation was applied to each tank. The 24x48-in. board sections were secured by 3/4-in. galvanized iron bands to the top and cylindrical surface of the tank. The iron bands were secured horizontally around the tank at 12-in. intervals to support the blocks. On top, iron bands were stretched along diameters, and the ends of each attached to the rim. Mineral wool block sections were staggered so as not to line up corners and edges.



Revolving grain driers, operating on 100 psi steam, minimize fuel requirements with 2-in. thick mineral wool block sections. The covering is waterproof cement

Sections of 1-in. wire netting were stretched over the mineral wool blocks and bands, and were tightly laced together with 18-gage wire. A 1/4 in. thickness of insulating cement was then trowelled into the wire netting and allowed to dry. A second 1/4-in. layer (5 parts insulating cement, 1 part Portland cement) was trowelled over the first to provide a smooth, level surface. One-inch wire netting was tight-



These tanks contain 500 bbl of water at 200 F. To maintain this temperature, 24x 48-in. mineral wool board sections, held in place by ¾-in. bands were applied

ly stretched over the cement to serve as a key for two heavy coats of asphalt mastic. A coat of aluminum paint was applied over the dry mastic to prevent "bleeding" of the asphalt through the two coats of oil paint that finish the installation.

What might be called the "heart" of the Duquesne brewing process appears to be two cereal cookers. Corn and rice are boiled in these units, which are located on the left balcony. Later, the cereals are combined with the cold malt mash in the two mash tuns under the left balcony. The resulting converted mash is then pumped to the three Lauter tuns opposite the cookers on the right-hand balcony (third floor). The liquid then runs through the slotted brass false bottoms of these units into the three brew kettles in the center of the room.

Mineral wool insulation on the cookers, tuns and kettles maintains proper temperatures throughout these processes. The stainless-steel vertical sides of each unit cover mineral board insulation 1½ in. thick.

As with the hot-water tanks, the 24x48-in. board sections were secured to the vertical sides of the brewing units by 3/4-in. galvanized iron bands on 12-in. centers that completely encircle the cylindrical sides. A ½-in. coat of insulating cement was then trowelled directly onto the surfaces of the mineral wool board sections. The stainless-steel jackets were installed over the insulating cement. All corners and edges of these jackets, as well as the brass sections of each unit, were thoroughly caulked to insure a watertight exterior.

Malt hulls, removed from the Lauter tuns, are dried in three grain driers located on the first floor. This revolving grain drier operates at a steam pressure of 100 psi. To minimize fuel requirements at this stage, each drier is insulated with 2-in. thick mineral wool blocks in 6x24-in. sections, secured by 3/4-in. galvanized iron bands on 12-in. centers along the length of the drier. The edges of the board sections are bevelled to insure a tight fit, and all sections are staggered so as not to line up the edges.

Sections of 1-in. 20-gage galvanized iron wire netting were laced over the insulation. A 1/4 in. thickness of insulating cement was then trowelled over the wire netting and, when dry, followed with a 1/4-in. layer of finishing cement (5 parts insulating cement, 1 part Portland cement). An 8-oz canvas jacket was secured with waterproof cement over the finishing cement. The insulation was completed with two coats of enamel paint applied over a single coat of glue sizing, which had been absorbed into the canvas jacket.

At each stage—hot-water tanks, brewing units and grain driers—the mineral wool insulation contributes directly to high process efficiency and helps maintain the delicate temperature balances.

Techniques employed at the new Duquesne brewhouse are also useful in applying board or block insulation to large equipment in the power, chemcal, food and oil industries. Whatever the temperature of the equipment —or its functions—good insulation performance is in large measure the result of skillfully engineered application.

The Cover Illustration — Power On the Spot

• Against the scenic background of the Canadian Rockies this Pioneer duplex crushing plant, owned by Emil Anderson Construction Co., provided the highway surfacing material for the direct road between Hope and Princeton, B. C., Canada.

The plant, powered by a belt drive from a "Caterpillar" diesel D13000 engine, produced over 750 cu yd of crushed gravel daily while the road was being built. Conservation of transmission belting that drives this crusher, as well as conservation of other types of industrial rubber products, are covered in the article beginning on page 85.

The editors gratefully acknowledge the cooperation of the Caterpillar Tractor Company in supplying the original material from which INDUSTRY AND POWER made the engravings for printing the four-color cover illustration on this issue.

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★ WHAT TO DO UNTIL THE DOCTOR COMES

TWO OR THREE PHASE WITH STANDARD TRANSFORMERS

TRANSFORMATION from three- to two-phase power, or vice versa, is most commonly made by the well-known Scott connection with special transformers. However, when the chips are down, one of these schemes or a variation thereof can do an adequate job with transformers frequently on hand.

Temporary phase transformations can make two- and three-phase equipment interchangeable in an emergency or replace permanent transformers during repairs or installation.

Modified Scott transformation using a teaser transformer with a 10 per cent tap or two 5 per cent taps is shown in Fig. 1. The two-phase voltages will be unbalanced only about 4 per cent, with some additional unbalance due to ordinary transformers.

In Fig. 1, two-winding transformers are used for appreciable voltage transformation and secondary windings are isolated, allowing use with two-phase motors interconnected at midpoints. The two-phase lines also may be connected for a three-wire system. Transformer ratings must be reduced about 15 per cent.

Another connection with isolated two-phase windings, Fig. 2, uses two transformers with the same secondary voltage but with the primary of *A* wound for the line-to-line three-phase Y voltage and the primary of *B* for the line-to-neutral voltage, as for 4160 and 2400 v. Rating of each transformer is one-half the two-phase load.

Auto-transformers, as in Fig. 3, are generally used for phase transformation without considerable change in voltage. Motors interconnected at midpoints cannot be used. The teaser winding included in the three-phase circuit is for 86.6 per cent of the line voltage for exact balance, but may be 90 per cent for approximate results.

Connections shown in Fig. 4 permit voltage and phase transformation with isolation of primary and secondary circuits, and combined three-phase, three-wire and two-phase, four-wire loads. The autotransformer, with an 86.6 or 90 per cent tap, is connected between apex and midpoint of the delta, making the two- and three-phase voltages approximately equal. With no three-phase load, about 75 per cent of the bank rating may be drawn from the two-phase lines.

Primaries in Fig. 4 may be connected either star or delta. Obviously, where a three-phase bank is already available and the midpoint of one of the secondaries can be reached, only an autotransformer is necessary.

Circuits shown were chosen from material issued by Westinghouse Electric Corporation because they can be used with standard equipment in an emergency. Many variations are possible. For example, if the teaser with 10 per cent taps, Fig. 1, is not available, an autotransformer with the proper rating can be used on either primary or secondary side of an ordinary transformer to step up the teaser voltage. An increase of 10 to 20 per cent will keep the output within the range of 5 per cent below to 5 per cent above the voltage of the main transformer.

Where it is desired to take two-phase power from a three-phase line without voltage change and the transformer bank of Fig. 4 is not handy, Fig. 3 may be used. Both output and input to the main transformer then connect to the end terminals and it becomes a simple mid-tapped autotransformer. The teaser becomes a step-up transformer as in Fig. 4 instead of step-down as shown in Fig. 3, with the three-phase line connected to a 90 per cent tap for approximate balance.

The two phases of Figs. 3 and 4 may be isolated with a one-to-one ratio, two-winding transformer in one phase and used thus, or reconnected for a three-wire system as the load demands. Two-winding units, of course, can also be connected as autotransformers.

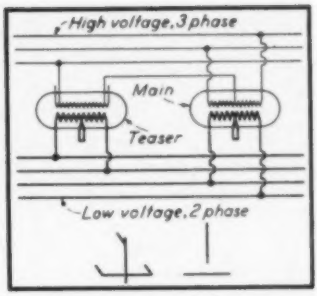

Fig. 1—Scott-connection teaser with 10% taps gives an approximate balance

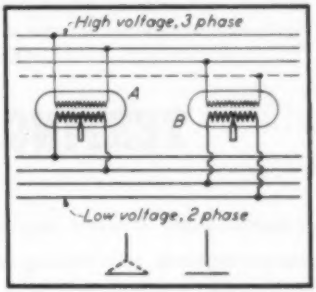

Fig. 2—A has a line-to-line rating, B, line-to-neutral for the three-phase Y

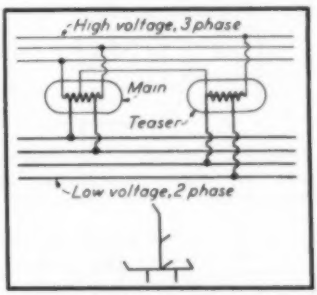

Fig. 3 — Autotransformer circuit is simple when there is no voltage change

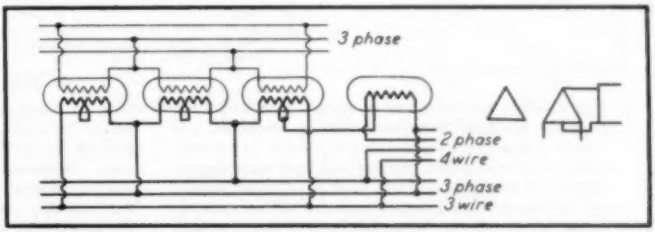

Fig. 4—Both two- and three-phase power is available on secondary side. Transformers may be an existing bank. Primaries can be either star or delta connected

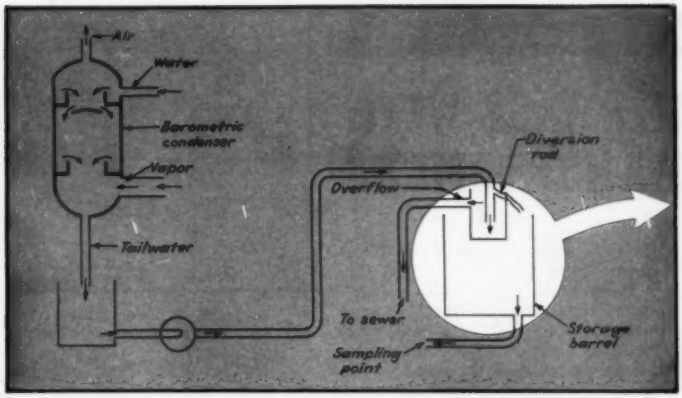

Fig. 1—Homemade systems are often adequate. Here a pump delivers tailwater at a constant rate to the catch basin. Inclined rod diverts small portion to storage barrel which is emptied every eight hours to obtain a composite sample

TESTING YOUR PLANT EFFLUENT

Industrial waste effluents may be harmful or valuable. A true picture depends on obtaining representative samples. One of these methods will give correct analysis for your plant system

CHARLES F. HAUCK
Hall Laboratories, Inc.

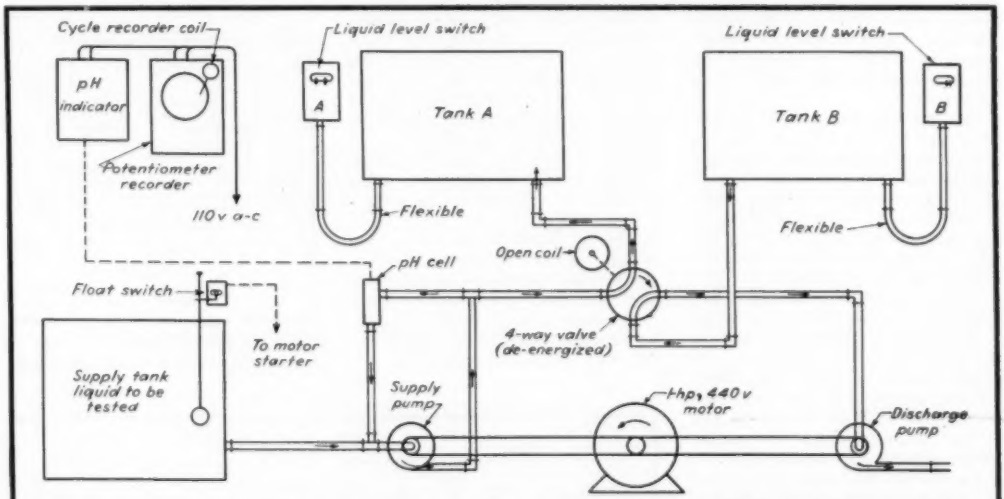

Fig. 2—This special purpose system was built in a portable machine and automatically measures and records waste-water volume and pH value on approximately 100 operations. Starting with both tanks empty, supply pump discharges into tank A. A small portion of the liquid is bypassed through the pH cell and returned to the pump. When the level of liquid in tank A has reached the height determined by switch A, a relay is energized, operating the four-way solenoid valve. The valve ports are thus rotated to empty tank A through the discharge pump to sewer or back to process. Meanwhile, the supply pump fills tank B until the liquid-level switch B is tripped, de-energizing the four-way valve and causing the cycle to repeat. Cycle recorder, operated by switches A and B, leaves marks on pH record chart to determine liquid volume.

INDUSTRY is coming to a realization of the need for studying its waterborne wastes, and such studies can reveal facts of great significance to plant management. Unfortunately, there is still inadequate appreciation of the importance of proper sampling and gaging methods, so that some of the information obtained can actually be misguiding.

In planning a program, one must consider that both the composition and flow rate of the waste stream are likely to vary considerably in the course of a typical day. Furthermore, difference in specific gravities of various substances increase the difficulty of getting a representative sample. Whereas oils concentrate near the surface, inorganic precipitates usually tend to collect near the bottom. In order that the sample may be typical, collection nearest the point of waste-water origin, where the stream is homogeneous, is desirable. Ideally, waste should fill the sampler from several points across the cross-section of flow at rates proportional to the flow velocities at these same points. See cross-section of flow line, Fig. 3.

Location of Test Point

Choice of test point is of great importance, not only for the above considerations, but also with relation to the information sought. If various branch lines contribute substances such as acids and alkalies which affect each other, a sample from the main stream will only reflect the net effect of these substances. When profiles of composition changes are sought, choice of location is even more important. In such cases, especially when catch samples are collected, timing of collection at several check points in the drainage system must be carefully synchronized.

Where variables exist, and particularly where checking is to continue over a long period, mechanical or automatic sampling and measuring equipment justifies the investment by lower operating costs and higher accuracy. With its use, the human element is eliminated and one can be sure that the sample will be collected in a fixed place, according to a pre-set pattern.

Automatic Collectors

Automatic equipment consists essentially of a mechanism which collects and transports the water from the waste-water stream to a container, and a mechanism which controls operation of the collecting device. Some units collect, at fixed intervals, a sample of variable size proportional to flow. A majority of the others, such as the ring type, collect a fixed volume at variable time intervals depending on flow rate.

Automatic apparatus can collect and transport the sample to a storage container by pump, plunger, scoop or water wheel. Some units measure and record flow as well. The equipment ranges in cost from $200 to $1,000, depending on accuracy and type of metering device employed in the automatic apparatus.

A number of plants design and fabricate their own equipment to fit particular needs. One simple arrangement, shown in Fig. 1, was devised to collect three 8-hr composite samples of barometric condenser tailwater. A pump delivers tailwater at constant rate to a waste pipe. A small part is diverted by an inclined rod to a large receiver from which the composite sample is drawn every eight hours. The remaining volume is drained to the sewer.

Special Samplers

Equipment shown in Fig. 2 was built to meet special requirements. It will automatically measure waste-water volume, determine pH, and record both values. It can be moved from place to place to collect detailed data on approximately 100 processing operations.

Ring type samplers shown in Figs. 3 and 4 indicate, record, and totalize flow at the test location and collect a definite volume at variable intervals depending on flow rate. These devices may be used with varying types of primary elements and collecting devices depending on the characteristics of the waterborne waste and physical conditions at the sampling station.

The applications illustrated by Figs. 5, 6 and 7 can use a venturi tube, orifice, weir or Parshall flume as the primary element, collecting continuously from the stream an amount proportional to the waste-water flow rate.

Automatic equipment provides a series of catch or grab samples which give snapshot pictures, or yield an average picture through compositing. Too often, a composite sample is misleading. For instance, a textile finish-

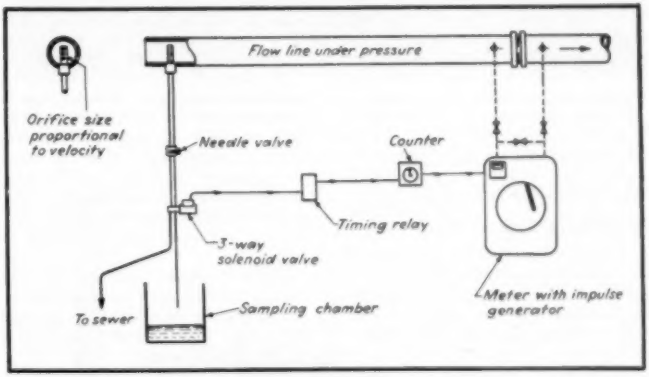

Fig. 3—For pressure lines, meter indicates, integrates and records flow. After definite flow volume, timed operation of valve collects constant volume sample

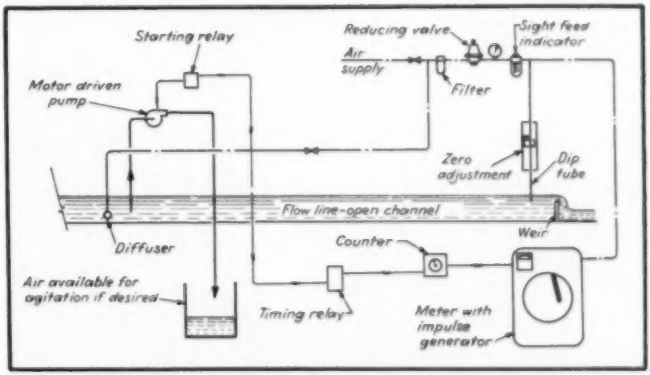

Fig. 4—Scheme is same as Fig. 3 but is for open channels. Timed operation of constant volume pump delivers sample. Primary elements vary to suit conditions

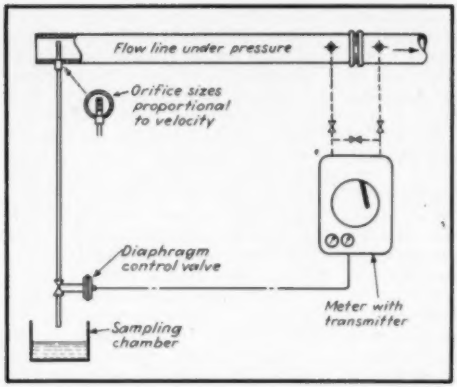

Fig. 5—Meter indicates, integrates and records flow, transmitting proportional pneumatic signal. Throttling valve passes sample proportional to flow to container

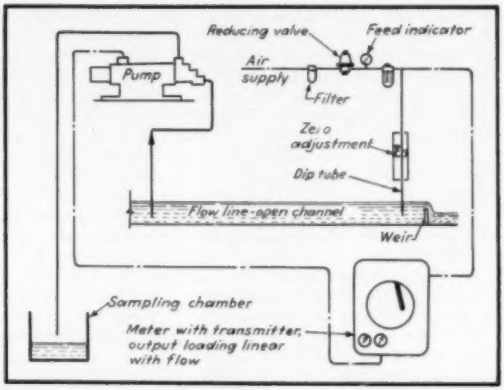

Fig. 6—Similar to Fig. 5, this method is for open channel. Pneumatic meter signal actuates controller to cause the pump to deliver to the container a sample proportional to flow

ing plant discharges strongly alkaline waste waters for an hour or two every day but discharges acid waste for the rest of the day. Whereas a 9-hr composite had a pH of 7.8, the catch samples, collected at 15-min intervals, revealed pH variations from 11.2 to 3.5.

In all cases, a sample should be identified as to its origin, method of collection and type and rate of operations during the test period. Unless all pertinent data are made part of the record, full interpretation of analytical results may be impossible.

Preserving Sample Properties

It is important that the properties of a sample be preserved between time of sampling and analysis. Prompt analysis is best insurance against change, but is seldom practical. Refrigeration at 6 to 10 C will repress volatilization of dissolved gases and retard biological activity that affects the chemical and physical characteristics of samples. Specific reagents can be used to preserve particular critical constituents such as cyanide, phenol and sulfide.

A number of recent installations combine continuous sampling with continuous analysis of some property such as specific gravity, pH, conductivity or temperature. Many of these arrangements are being used to neutralize alkaline or acid wastes automatically and commonly include recording and controlling functions as well.

In many instances, careful measurement of waste-water flow is also essential. It may be necessary to gage variable flows: (a) so that a representative composite sample can be manually obtained; (b) for computing material balances between points within the plant; (c) to obtain essential information for the design of industrial waste abatement or treatment facilities; or (d) for a combination of these reasons as necessary.

Flow Measurement

Flows can be measured by direct means, such as an orifice, nozzle, or weir, or indirectly as by calculation from the time a pump operates or from time required to drain or fill a vessel. Selection of a metering device for a specific job depends on local conditions, length of time gaging will continue, degree of accuracy required, variability of flow and similar factors.

A number of plants have discovered that materials formerly channeled off as waste might economically be processed for reuse or for sale. One possibility is that of reusing the waste at other points in the plant. The other advantages of knowing what goes "down the drain" are so many as to merit careful study of a sampling and gaging program.

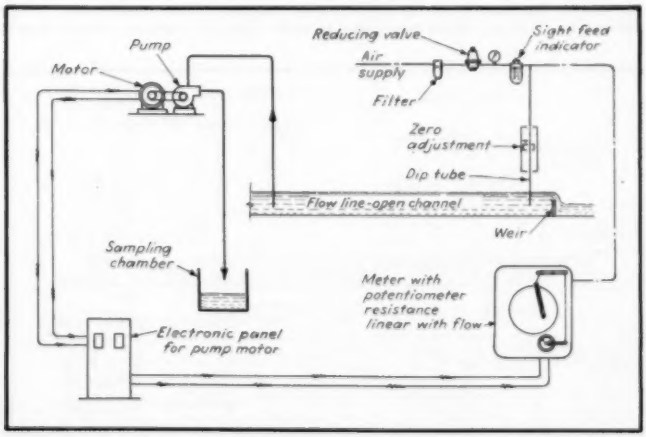

Fig 7—For use with electronic motor speed control, meter output is proportional to flow and, through converter, controls pump output to give proportional sample

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LOCOMOTIVES AS STANDBY STEAM PLANTS

RAILROAD locomotives are playing a unique role in the production of military aviation gasoline at Sun Oil Company's refinery at Marcus Hook, Pa.

Pressed into service because of a serious delay in the delivery of large new boiler equipment, a dozen engines on railroad sidings inside the refinery are helping to provide the steam requirements of the aviation gasoline plants.

Use of the locomotives as "mobile boilerhouses" has permitted Sun to meet in full its commitments for aviation fuel, large quantities of which fuel are being made at this refinery for U.S. Armed Forces.

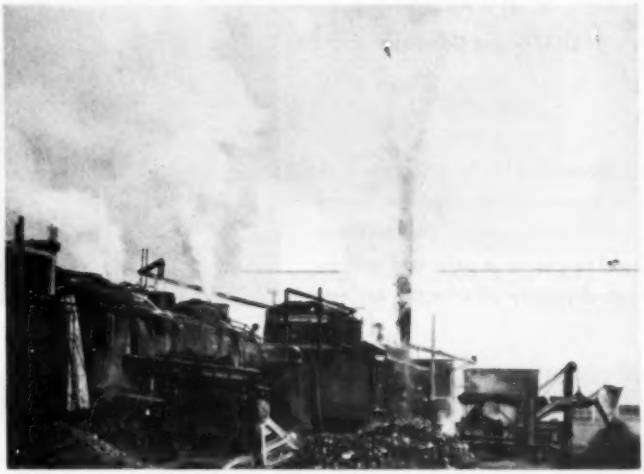
Steam from the locomotives passes through manifolds to lines connected with the refinery's main steam system, supplementing the supply from existing sources. The operation continues day and night.

In adapting the locomotives to this use to avert a possible steam deficiency during the winter period of peak steam requirements, refinery engineers further improvised by modifying the engines' boiler equipment to permit them to utilize refinery gas instead of coal as fuel.

Determined that there should be no delay in aviation gasoline shipments, refinery managers leased from the Pennsylvania Railroad and the Reading Railway Company the 12 locomotives to provide the necessary steam pending delivery and installation of the new boiler.

A couple of months ago, ingenuity of a similar nature paid off at Caterpillar Tractor Company's new plant at Joliet, Ill. when the thermometer dropped to 19 deg F below zero. Two Rock Island Railroad locomotives were leased by Caterpillar and moved to the construction site, where simple steamline hookups were made to supply heat inside the 7500 sq ft area and enable construction crews to maintain their schedule. Coal-storage capacity of the locomotive tenders was more than doubled by improvised wood cribs extending more than 6 ft above the top deck of the tanks.

The first scraper has already rolled off the assembly line at this new plant, less than 12 months after the 300-acre tract was acquired. Full production of Caterpillar's road building machinery at this plant is not anticipated until January, 1952.



Construction at Caterpillar's Joliet plant would have stopped last winter had locomotives not been pressed into service to meet steam-heat demand

"Mobile boilerhouses" supply steam in emergency at Marcus Hook plant of Sun Oil Co., helping the company meet commitments for aviation gasoline

Fig. 1—Sectionalized utility company tie lines, with switching controlled by the utility's dispatcher, deliver power to the primary substations ——→

J. M. WEBB
R. H. WHALEY
Eli Lilly and Company

Sectionalized tie-lines and feeders, switchgear vaults and motor control centers are among the methods used to obtain a safe and uninterrupted supply of • • • •

POWER FOR A CHEMICAL PROCESSING

EXPANSION of production in one pharmaceutical plant and acquisition of another two miles away have necessitated installation of new distribution equipment in the Indianapolis division. Modern, prefabricated units and latest wiring layouts have produced a safe, integrated system which supplies the manufacturing needs of these plants where power consumption per employee has doubled to reach 2 kw per person in the last decade.

Besides meeting the problems of efficient and economical distribution of power as common to most industries, the distribution systems had to fill such specialized demands as continuity of service in many processes and safety in the vicinity of inflammable vapors.

The McCarthy Street plant, which has doubled in size in the last ten years, is the original location. Products include items such as insulin, hard capsules, ampoules, tablets, elixirs and chemical products. Also in the area are the research, administration, chemical pilot plant and gland products pilot plant buildings.

Part of the earlier electrical and steam system, two turbine generators totaling 2500 kw at 4160 v are in use. Steam pressure at the throttle is 250 psi. One turbine exhausts steam at 100 psi and the other is bled at 100 psi and exhausts at 5 psi, the turbines thereby acting as reducing valves to supply steam for plant needs. Steam is obtained from the Indianapolis Power and Light Company (which also supplies the electrical power) from a plant one mile away through the original 10-in. and a newer 12 in. pipe line. The generators at present provide about 45 per cent of the energy used at the McCarthy Street location.

Fig. 1 shows the 33/4.16-kv substation which receives power from utility lines consisting of an unmetered bus connecting two utility substations. This bus can be sectionalized at the local station by two power company 1200-amp, 1,000,000-kva, 33-kv oil circuit breakers operated by a supervisory control system that terminates at the utility dispatcher's board. Space has been provided for a third breaker to be installed in 1951 and connected to the 33-kv underground system to be brought into the neighborhood of the plant.

Substation Connections

The unmetered 33-kv bus is connected to the metered bus and to the primaries of the transformers through dual metering units and through disconnect switches, load break switches and primary fuses. A constant voltage at the secondaries of the two 5000-kva outdoor, oil-cooled unit transformer is maintained by means of load-ratio control equipment. Secondary terminals of each transformer are connected through an outdoor, metal-clad bus section to a 600-amp 100,000-kva air circuit breaker equipped with time-overcurrent relays.

Both the utility system breakers and the two bank breakers are closed and tripped by 125-v, d-c power and the position is indicated in the utility dispatcher's board.

Two 4160-v circuits each consisting of two 500,000 cir mil, 5-kv cables per phase in underground fiber conduit connect the secondary bank breakers with the 4160-v metal-clad switchgear buses located approximately 1200 ft from the substation. Incoming breakers at the plant are 1200-amp 150,000-kva air breakers with time-overcurrent and directional relays.

Output from the previously mentioned turbine generators is paralleled to the plant bus through 600-amp air breakers equipped with differential and under-voltage relays. The generators are also protected with underspeed and overspeed devices. Through a contact-making, reactive device which actuates the fields, the generators assist in maintaining the plant power factor in the neighborhood of 95-100 per cent.

The McCarthy Street plant is thus protected with a reliable source of electrical energy by the interconnection and parallel operation to the generators and the utility lines.

Twenty-three unit load centers and step-down transformer banks are connected to the 4160-v plant bus through air circuit breakers operated by time-over-current relays. All new feeders installed are three-conductor, 350,000 cir mil, 5-kv cable in underground

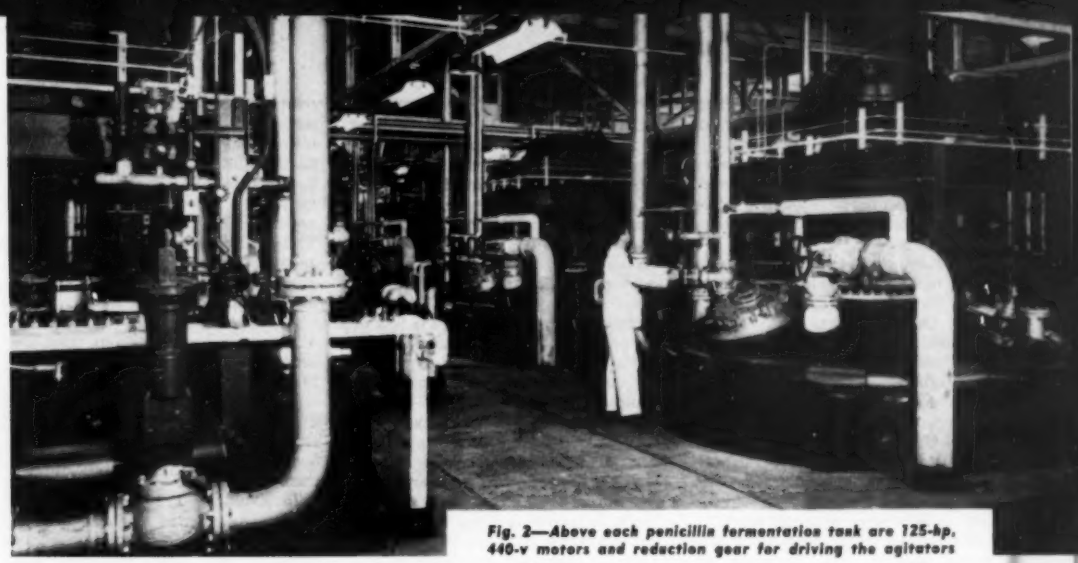


Fig. 2—Above each penicillin fermentation tank are 125-hp, 440-v motors and reduction gear for driving the agitators

PLANT

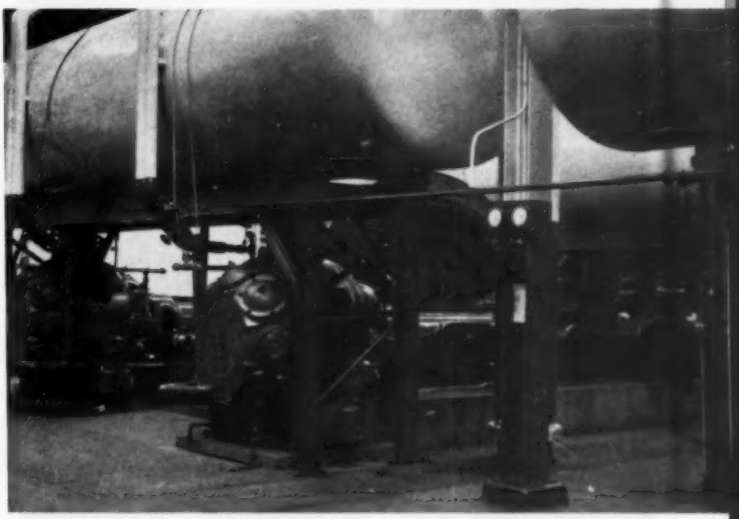


Fig. 3—Compressors driven by 1750-hp synchronous motors supply the air needed to grow penicillin mold. Power interruption would kill mold, cost days of production

fiber duct systems. The dual radial system is being extended to the older transformer banks as conditions permit. A grounding system is incorporated with all the feeders being connected to the grounding network at the 33-kv substation, to the neutral bushing of each unit substation, to all load centers, and to the water mains in the various buildings.

Feeder Connections

The four feeders form a dual radial system connected to the load center substations through manually operated, three-position selector switches. These are interlocked with the low-voltage secondary breakers at the load center to prevent operation on any current greater than the transformer magnetizing current.

Primary selector switches at each load center and the means for transferring the feeder load at the plant bus provide flexibility and make removal of all breakers possible, in line with the plant preventative maintenance program.

Secondary power at the load center is 440-v, three-phase for motors of ¼ hp or more, with 120/240-v single phase, 120-v three-phase and 120/208-v three-phase four-wire for lighting and small motors. Secondary connections at the load centers are through air breakers to the various types of distribution systems required for the different operations in the area.

A typical load center installation is used in the gland products manufacturing area. Six substations, totaling 2250 kva, are normally connected to one of the two primary feeders by the selector switch. Secondaries of five of the six centers are paralleled through air breakers, providing a continuous electrical supply for manufacturing a product which deteriorates rapidly once processing has started.

Located on different levels, each of the load centers is installed in a vault, isolating it and associated equipment from the manufacturing area by means of a fire-wall. All motors, controls, wiring, devices and lighting used in the area must be approved for Class I Group D locations because of volatile solvents used in processing. Every possible contact making device is located in the transformer vaults so that the less expensive, general-purpose equipment might be used.

Combination magnetic starters for motors are installed in the vaults and controlled by pushbuttons in the hazardous locations. Disconnecting devices are also located at the motors, eliminating the need for unauthorized personnel to enter the vaults and per-

mitting operators and maintenance men to disconnect the equipment for safety in servicing.

Lighting transformers are installed in the vaults at each floor level. Service is distributed through lighting panels adjacent to the dry-type transformers.

The Kentucky Avenue plant was acquired in 1946 and converted for the production of penicillin and streptomycin. Other products include hard and soft capsules and pulvules. Also in the area are a penicillin pilot plant, the Eli Lilly and Company international offices and the shipping department.

The penicillin plant was installed in part of the single-story building near the power plant and electrical distribution center. A considerable savings was made because the steam and electric lines could be kept relatively short.

Manufacture of penicillin is a continuous process and continuity of service from all of the utilities is imperative. For example, large quantities of air cleaned by electrostatic filters are required in the growth of penicillin mold in the large fermentation tanks. The air is supplied by two reciprocating compressors, Fig. 3, each delivering 15,000 cfm at 30 psi. Each machine is driven by a 1750-hp 4160-v synchronous motor. Interruption of the electrical service to the compressors for more than 5 min results in the loss of the penicillin mold in the tanks as well as the loss of days required to sterilize the tanks and again put them in operation.

Each tank is also equipped with agitators, motor driven through reduction gears. The 125-hp motors, Fig. 2, operate on three-phase, 440-v power.

Continuity of service for the large blocks of power is given by a substation with two 5000-kva transformers. They are connected to another utility-company 33-kv tie line which can be sectionalized by the utility dispatcher in the same manner as at the McCarthy Street station. Each transformer has built-in 33-kv potential transformers with secondaries connected in broken delta to undervoltage relays. These will trip the incoming breakers at the 4160-v plant bus in case of ground on the 33-kv primary transformer winding.

The plant bus is serviced by two 4160 v underground circuits from the substation 500 ft away. Incoming oil breakers are 1200-amp 250,000-kva capacity and are equipped with time-overcurrent relays. Three bus sections connected by tie breakers form a ring bus in the metal-clad switchgear compartments, Fig. 4.

Each of the 1750-hp synchronous motors is connected to the plant bus by 1200-amp, 250,000-kva oil circuit breakers with time-overcurrent and thermal relays. Breakers are operated by remote pushbutton devices.

Twelve unit load centers and step-down transformer banks are connected to the plant bus in eight circuits protected by 1200-amp 250,000-kva oil breakers with time-overcurrent relays. A system of dual radial feeders, similar to that at the McCarthy Street plant, is connected to the unit load centers by primary selector switches.

Secondary load voltages are 440-v, three-phase for power and 120/208-v, three-phase four-wire for lighting. This power is mostly distributed throughout the utilization area in a metal enclosed bus system.

Motor control centers, Fig. 5, have been installed in all manufacturing areas in the approximate center of large groups of motors, conserving space and limiting the amount of control equipment at the manufacturing operation. The central location keeps wiring costs to a minimum for groups of motors.

Each motor control center is equipped with a main circuit breaker to isolate the center from the 440-v system. Ground indicating lights installed ahead of the breaker help to quickly trace grounds on the three-phase system.

Power conductors and control circuits are connected at the motor through a disconnect switch and a pushbutton. The control circuit connected through one leg prevents operation of the switch as a motor starter. A cross-tagging system facilitates identification of each starter and the equipment it controls.

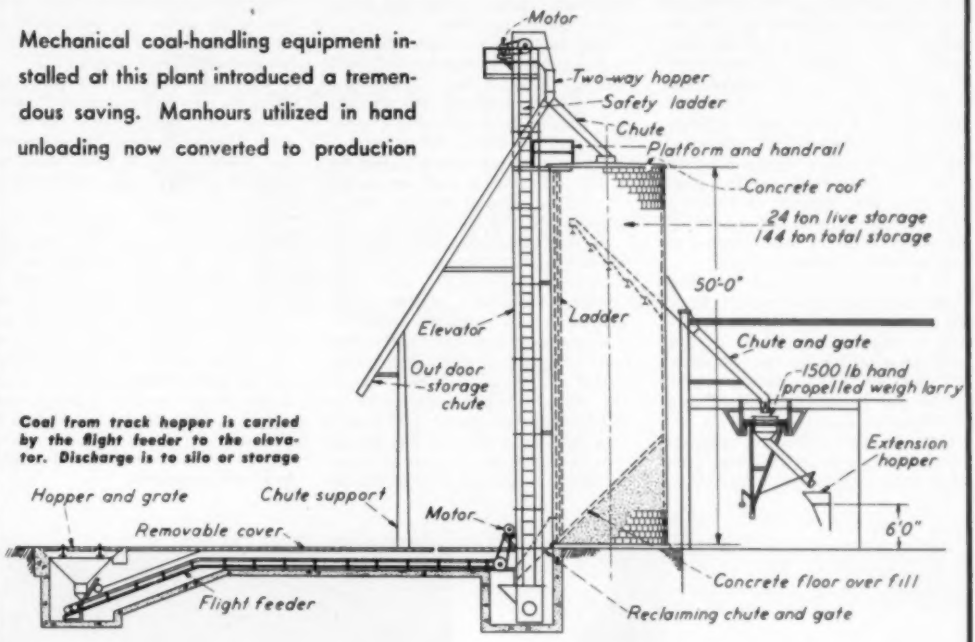
An effort has been made to standardize all control equipment eliminating stocks of a large variety of parts.

Abstracted from a paper presented at a recent AIEE Power Conference.

Fig. 4—Feeder switchgear is connected to form a ring bus system in this 4160-v, metal-clad unit. A typical load-center installation is visible in the background

Fig. 5—Motor control centers on 440-v supply are installed in manufacturing areas. In hazardous locations, all possible switchgear is installed in vaults

Mechanical coal-handling equipment installed at this plant introduced a tremendous saving. Manhours utilized in hand unloading now converted to production



ENGINEERED HANDLING OF COAL FROM CARS TO BOILER

TROY SUNSHADE CO., nationally known manufacturers of porch and lawn furniture, restaurant, club, hotel, store and office chrome-plated furniture and numerous other diversified products, was confronted with two serious problems affecting its powerhouse operation.

First, obsolescence had made the cost of handling coal prohibitive for its ever increasing demand for generated steam for heating and manufacturing processing.

Second, a critical labor shortage brought about by the war not only added further to the powerhouse operating costs where labor could be obtained, but the supply of help obtainable was far from adequate to do the job. It became obvious that a drastic change in present coal handling must be made—and made quickly.

Engineers of the Fairfield Engineering Co. were consulted and a recommendation was made. A coal-handling system, especially designed to alleviate the problems confronting Troy Sunshade Co., was accepted, installed and put in operation.

Coal was delivered in flat-bottom gondolas to a railroad siding adjacent to an improvized wooden storage bin back of the powerhouse.

Four men, at an average pay of 65 cents per hr, would shovel coal by hand from the railroad car into waiting wheelbarrows. Two wheelbarrows, each with an operator, at 65 cents per hr, were used to haul the coal to two chutes built into the boilerhouse wall. These chutes spilled the coal onto the boilerhouse floor within 4 ft of the two existing boilers operated by the company. When the coal stockpile at the boilers was ample, the wheelbarrow operators would dump the coal into a coal storage bin directly beneath the wheelbarrow runaway.

SAVINGS AND ADVANTAGES

- ***Manpower previously required to unload coal now utilized in production***
- ***$39.00 saved per day***
- ***60 ton coal car unloaded automatically in 3 hr, as compared to 50 ton in 10 hr***
- ***Cleaner and more efficient coal handling***
- ***Boiler operation at maximum with automatic coal handling***
- ***Former coal-handling hazards and inefficiencies eliminated***
- ***Engineer's job simplified***

The wheelbarrow runway led directly to one coal chute in the powerhouse wall. However, in order to feed the second boiler, a branch off the main runway was required so that coal could be piled in front of each boiler. The entire runway was built of wood and supported by a typical trellis arrangement. In addition to this outmoded handling, the boilers were hand fired.

By this method of handling coal, four men were required to unload a 50 ton car of coal with two men working steady with the wheelbarrows to keep the boilers operating.

At 65 cents per hr per man, this meant that each man received $6.50 for 10 hr, or a total outlay of $26.00. Add to this another $13.00 for the 10 hrs worked for the two wheelbarrow operators, and a total expense of $39.00 was incurred for unloading a 50 ton car of coal.

Since the two wheelbarrow operators were working steadily delivering coal, either from car to boiler chutes or storage bin to boiler chutes, there was a permanent charge against this operation of $65.00 per week.

Coal now is delivered to a siding next to an all-cement storage bin that holds 500 ton. This bin was not actually a part of the recommendations, although it is vital to the success of the installation and becomes an integral part of the entire efficient operation. The coal is now delivered in a 60 ton hopper car and is dumped directly over a specially designed track hopper.

A flight conveyer, extending the full length of the storage bin at floor level, carries the coal to a silo bucket elevator, which has a coal storage of 156 ton with a 22 ton storage shelf.

When the silo is filled, the feed spout at the top of the bucket elevator is shut off by an especially devised trip, which simultaneously opens the coal storage bin chute. The coal is then diverted to the coal bin storage.

In the event the silo has to be replenished, an outside storage bin has been arranged with a flight conveyer. This unit extends the full length of the bin, at the center line, and it picks up and delivers coal to the silo bucket elevator and thence to storage.

Inside the boiler room coal is fed from the silo into a chute and into a weigh larry that holds 1,500 lb of coal. This weigh larry travels between the two 395-hp B&W boilers and feeds stoker hoppers, designed and furnished by Fairfield.

At a cost of $11,000.00 the coal-handling system, installed at Troy Sunshade Co. has made possible the automatic handling of the entire coal re-equipment. Thus the $39.00 paid out for unloading a 50 ton car of coal was eliminated and lead to the speeding up of the present 60 ton hopper bottom car unloading. Instead of 10 hr to unload a 50 ton car of coal, it now takes only 3 hr for a 60 ton car of coal. In addition, the manpower necessary to unload the coal is now turned to more productive operation.

When coal silo is filled to capacity the elevator lifts and spills it through the pipe to the outdoor storage bin

Track hopper permits unloading 60 ton of coal mechanically in a matter of 3 hr, as compared to 10 hr with hand labor

Coal from the silo is transferred mechanically to the overhead weigh larry. It is then fed into each stoker hopper

American industry today faces the greatest task in its history — conservation of resources, increased production with present equipment, and greater utilization of manpower

The Plant Engineering Group plays an important part in this task by making equipment last longer, require less maintenance, and produce more consumer and capital goods

A practical approach to the conservation of vital rubber is found in the following pages. Hundreds of suggestions are given on how to select, install and maintain conveyer belting, flat transmission belting, V-belts, hose and packing

CONVEYER BELTING

BEST INSURANCE against premature failure of conveyer belting is proper design. Such factors as proper belt width, correct number of plies and cover thickness, proper tension, best possible loading and dumping arrangement, and correct pulleys and idlers should be carefully considered when selecting the belt for a given installation.

Once proper selection has been made and the belt is in operation, proper maintenance will increase the life of the belt. Preventive maintenance can be accomplished through (1) *inspection,* (2) *lubrication, and* (3) *repair.*

INSPECTION— Periodic inspection of the belt, idlers, lead and tail pulleys and drive are *musts.* Inspection of the belt proper should be made daily, looking carefully for breaks in the cover, caking of the material handled, tears at the fasteners or openings of the splice if the belt is endless. Periodic checks should be made for excessive spillage. The belt cleaner should be inspected regularly to be certain particles of the material handled have not lodged under idlers or pulleys causing scraping of the belt.

The tension should be checked to assure there is no ex-

cessive slack. Excessive slack will cause slippage which in turn will cause rapid wear and even fire in extreme cases. Sometimes it is necessary to lag pulley to stop slippage. If tension is too great any shock load on the belt may cause a rupture of the carcass.

Proper alignment is of the utmost importance and should be checked often. A belt not properly aligned will soon begin to wear unevenly.

Pulleys and idlers should be checked at least every 30 to 90 days. Also, regular checks should be made of the electrical and mechanical equipment.

LUBRICATION—Lubrication of all moving parts should be made according to a regular schedule. Head and tail pulley should be lubricated frequently depending upon the type of bearing—sleeve bearing types daily and anti-friction bearings every three months.

Idlers should be inspected and lubricated regularly. Some idlers under a severe loading condition need lubricating every three to four weeks, while others, because of usage and design, need lubricating only at three to six month intervals. Be sure to lubricate as needed to keep idlers in free rotating condition.

Care should be taken not to over-lubricate; any excess of oil or grease will find its way onto the belt and cause rapid deterioration.

For the proper selection of lubricants a responsible manufacturer of lubricants should be consulted.

REPAIR—At the first sign of tears or punctures of the cover, repairs should be made. The smallest tear will become progressively worse if operation is continued.

Temporary repairs can be made if time will not allow shutting down the unit for permanent repair. Some operating men prefer rip plates for temporary repair. They are available in a large variety of sizes and shapes and in different alloys to resist corrosion and abrasion. This repair unit consists of two plates. The top one is centered over the break and is held to the bottom plate by bolts through the belt. Bolt holes are countersunk in the plate so there are no projections. Other people prefer cold patches which are applied directly over the break. Before joining a belt with metal fasteners the ends should be absolutely square. Always use a straight edge as a knife guide when cutting a belt. When applying metal fasteners allow as much space as possible from end of belt to first row of the fastener. Be certain to use the proper size fastener. Too small fasteners will not carry the load and too large fasteners will tear the belt. Worn fasteners should be replaced immediately before they have a chance to injure the belt.

For permanent repairs vulcanized patches are preferred. However, trained crews and small portable vulcanizers are necessary to give a satisfactory job. As a general rule,, vulcanized splices are best in high tension usage. Metal fasteners are becoming more popular for most other jobs. Metal fasteners are held together by hinge pins and are easily separated. These joints are interchangeable and new sections of belts can be added easily. When metal fasteners are used there is an opportunity for moisture and foreign material to enter fabric and destroy its strength. Belts 24 in. or over should be notched at belt edges to prevent fastener from being distorted at edges.

It is a wise policy to put one man in charge of inspection and lubrication of your conveyer installation so that he can be held responsible.

In addition to the regular maintenance as outlined above, re-examine such factors as your loading conditions and skirt boards if they are used.

CORRECT LOADING—Much damage and unnecessary wear can be caused by the improper positioning of the loading chute. Arrange the loading chute so that material will be delivered to the belt in the direction the belt runs and at approximately the same speed. However, do not load the conveyer at an angle from the side if this can be avoided. The side thrust of the material increases the wear on the belt, and will probably make it run crooked.

If possible, arrange the loading chute to be directly over the belt and do not allow it to rub on the belt. Material should not be dropped on the belt, but the loading chute should be so arranged as to slide it on. At the same time the conveyer should be properly loaded so the entire working surface is utilized, and thus the wear is equalized and actually decreased for the tonnage handled. Before the conveyer is stopped, it should be unloaded so that starting up again will be easier. However, if a loaded belt is stopped for emergency purposes be sure to start it as soon as possible.

When conveying certain types of stone, gravel, etc., the chute should be so arranged as to allow the fines to come on to the belt first to protect it from the shock of large lumps. This can often be accomplished by the installation of a grating at the bottom end of the chute. This grate should be carefully checked to prevent it from becoming clogged.

If the chute is too steep, baffles should be installed to ease the material on to the belt. However, do not slow up the material too much with baffles, or the conveyer will be only partly loaded.

WATCH YOUR SKIRT BOARDS—In all cases possible skirt boards should be avoided as they are dangerous, leading to possible accidents as well as causing heavy wear on the belt.

If spillage at the loading point becomes a serious problem, skirt boards should be installed. These should be approximately three to four times the belt width in length.

The space between the skirt boards and the belt should increase in the direction of the travel of the belt. This is to al-

low the pieces of material that may get between the boards to work themselves free. Material that becomes wedged between the board and the belt will gouge the cover of the belt. A periodic check of the adjustment of the skirt boards will prove of value in preventing the belt from rubbing on the boards and causing unnecessary wear.

By closely following a thoroughly planned maintenance program the life of your belt will be greatly lengthened. Belts that have been properly maintained have given satisfactory service for over 25 yr. On the other hand, belts that have been neglected have failed under normal operating conditions in 2 or 3 yr.

FLAT BELTING

SELECTION TIPS—1. Standardize on as few belt widths, plies and types of construction as possible. This will reduce belt inventory.

2. When ordering them, make sure belts selected have ample capacity for their loads and that they are suited to operating conditions. An excess capacity in a belt pays off in longer belt life and reduced maintenance costs.

3. Use endless belts wherever possible.

4. Do not use belts which are too thick for the drive. Avoid thick, narrow belts and excessively wide, thin ones.

5. Buy endless belts for quarter-turn installations.

6. Never order a new belt from the length of an old one. The old belt has stretched through usage.

7. Select pulleys with a face ½ to 2 in. wider than the belt.

8. Avoid vertical drives whenever possible. Where necessary, select a belt of ample capacity for load and operating conditions.

9. Select neoprene constructed belts for operating under oily conditions.

INSTALLATION SUGGESTIONS—1. Slack side of the belt should be on top. This increases the arc of the belt's contact with the pulley.

2. Do not use rope to install a belt on its pulleys.

3. Avoid belt speeds above 5000 fpm. If higher speeds are necessary, consult a manufacturer's representative for recommendations on the proper belt to be used.

4. Do not use undersized pulleys. They cause fasteners to pull out; also ply separation.

5. Do not use crowned idler pulleys; they put a reverse bend across the belt's width which leads to ply separation, blistering and fastener failure.

6. Excessive crown on pulleys should be avoided. It may result in strains upon the center of the belt, causing premature failure of fasteners and ply separation.

7. Belts should not run on flat-faced pulleys except on idlers and shifter drives.

8. Align shafting and pulleys so center of belt runs on the center of pulley face. Improper alignments cause the belt to run off the pulleys.

9. Check idler-pulley alignment.

10. All belts except narrow ones and those operating on adjustable centers should be joined on the drive by bringing the ends together by means of clamps prior to making the joint.

11. Where folded belts are installed, keep the seam on the outside except where pulleys have excessive crown.

12. Belts should not be allowed to run against stationary objects. Such operations cause the edges of the belt to break and result in early ply separation.

13. Make sure ends are cut square before joining. Use a steel square as a guide for the knife.

14. Allow the proper spacing between the nearest row of fasteners and the ends of the belt.

15. Use proper type and size of fasteners for the belts and the pulleys they run over. Wrong size fasteners pull out.

MAINTENANCE DO'S AND DON'TS—1. Establish a regular schedule for belt inspection.

2. Keep belts and pulleys clean.

3. Check belt shifters at regular intervals to see that they are not abusing the belt and causing belt-edge wear. Shifters with anti-friction bearings in their sides reduce edge wear.

4. Use belt dressing sparingly for only in extreme cases is it required. Excessive oil dressing acts as a lubricant and increases belt slippage.

5. Do not use resin or other sticky belt dressings. Such dressings cake and build up lumps on the belt and pulleys which subject the belt to extra stresses. Use only castor oil base dressing on Crude or Buna S belts. Mineral oil dressings are not advisable.

6. Prevent lubricating oil from bearings and other sources from getting on rubber belts. Oil and grease destroy the belt structure, causing an uneven stretch and fasteners to pull out.

7. Inspect pulley surfaces at periodic intervals for signs of abrasive substances. Glazing indicates slippage. Correct by tightening.

8. Renew worn fasteners before they break and damage the belt.

9. Do not operate a belt running off one side of the pulley. It will cause the belt fasteners to fail and the belt to stretch unevenly across its width.

10. Operate belts with the minimum of tension to prevent slippage.

11. Avoid operating a belt that is too loose. Belt will slip excessively and the frictional heat created will burn and crack its surface.

12. Do not operate a belt that is too tight. It will crack and fail prematurely; it will also overheat the shaft bearings.

13. Use a speed counter and pulley ratios to check a belt's slip and creep. The creep and slippage of a belt should not be more than 2 per cent.

14. Replace worn idler-pulley bearings for they cause belts to weave when running.

15. Store spare belts in a cool, dry place away from heating pipes, sunlight, oil, corrosive fumes and excessive moisture.

V-BELTS

SELECTION TIPS—1. Use a sufficient number of correct size belts to handle the maximum load without excessive tension.

2. Where V-belts must operate in oily conditions, install neoprene constructed belts.

3. Skimping on the number of belts or the sheave diameters shortens belt life. Do not under-belt!

4. Do not use sheaves smaller than recommended minimum pitch diameters.

5. Avoid too small sheave diameters. Bending in a smaller arc than the normal one distorts the belt; generates excessive heat by internal friction.

6. Avoid vertical drives. Where necessary, install an ample number of belts for the load and conditions in which they must operate.

INSTALLATION SUGGESTIONS—1. Check often for stretch and sag, especially during the breaking-in period.

2. Allow enough clearance so belts can sag somewhat without touching guards or steelwork.

3. Original tension of a new set can be generally higher to allow for initial stretch and groove seating.

4. Install guards for protection against oils, greases and foreign materials, such as stones, dirt, etc.

5. Install only matched sets of belts.

6. Do not use idlers to put tension on the belts.

7. Install sufficient take-ups.

8. Never mix new belts with old belts on the same drive. This also applies to different makes.

9. Do not operate V-belts too tight. They will wedge down into the sheave grooves, reducing their efficiency and life, and causing unnecessary internal heating of the belt.

10. Avoid operating V-belts in temperatures in excess of 140 F, otherwise the rubber will be overcured which will result in reduced belt life.

11. Do not force or pry V-belts with tools. Release the take-up.

12. Clean grease off new sheaves before installing the belts.

13. Install well-ventilated guards to prevent heat from building up.

MAINTENANCE DO'S AND DON'TS— 1. Never use belt dressing on V-belts.

2. Do not operate V-belt drives at speeds above 5000 fpm if it can be avoided. If it cannot be avoided, consult a manufacturer's representative for his recommendations.

3. Oil bearings carefully. Wipe off excess oil so that it does not fall on the belts.

4. Keep sheaves and shafting in proper alignment, Improper alignment puts uneven tension on the belts and causes excessive wear on belts and sheave grooves.

5. Replace sheaves which are unduly worn or have harmful burrs and sharp groove corners.

6. Store spare belts in a dark, cool place.

7. Keep side walls of sheave grooves perfectly straight. The gripping power and efficiency of V-belts is greatly reduced when operating on uneven walls.

HOSE

STEAM HOSE—1. Make sure that the hose selected has a sufficient number of plies to handle the maximum working pressure.

2. Never install shut-off valves at the nozzle end of the hose for this confines both temperatures and pressure in the hose, seriously shortening its life.

3. Hose should be thoroughly dry before storing. All water should be drained out of the tube.

4. Where hose must be subjected to excessive temperatures, select hose with braided asbestos reinforcement.

5. Use neoprene constructed steam hose for service where oil and grease is encountered.

6. Leave free end open when shut-off valve is closed or steam will condense, create a vacuum and cause the hose to collapse.

7. Scrub grease, chemicals, and acids off cover with a mild alkali and then thoroughly rinse with plain water.

8. Oil or grease should never be applied to couplings. If they do not turn freely, put them in a pail of luke warm soapy water.

FIRE HOSE—1. Hose should be thoroughly dry before storing. This prevents mildew forming and general hose deterioration.

2. Make as few folds as possible when storing fire hose. Rearrange in such a manner that the folds will occur in a different place. This relieves continuous strain on one area.

3. Inspect hose frequently. If hose is used infrequently, run water through it once every three months to freshen the rubber and retard oxidation of the lining.

4. If jacket comes in contact with acid, wash with a 5 per cent solution of washing soda and then thoroughly rinse with plain water.

5. Check to make sure that standpipe valve does not leak into hose and cause dampness and mildew.

6. Unpack new hose as soon as it is received. Loosen coils to relieve strain on inner tube.

7. Store fire hose in a cool, well-ventilated location. If stored near steam pipes, the rubber in the tubing rapidly dries out and cracks. This will cause fire hose to burst when used in fighting a fire.

8. Do not pull hose around sharp corners.

COUPLINGS—Protect and preserve couplings. Brass is also a very critical material! Save your old fire hose couplings for possible re-use. This will save you money and insure your having couplings to attach to new hose.

COMPRESSED AIR HOSE—1. Always use hose that is designed to withstand the pressure conditions under which it will operate.
2. Keep oil out of air lines. This can be done by maintaining the compressor in good operating condition, proper lubrication of compressor, using aftercoolers and receivers of ample size, using oil and water separators on the air lines whenever there is a trace of oil.
3. When it is impossible to avoid oil, use neoprene air hose.
4. Avoid prolonged exposure of hose to heat, sunlight, acid fumes and oil.
5. Keep couplings free of grease.
6. Never strain hose by pulling it as though it were a tow line.

7. Do not drag hose across gravel, broken stone, or around sharp corners of equipment.
8. Avoid pulsating pressures.
9. Locate valves and other pipe fittings so that the hose can be connected to them from below, thereby letting hose hang down. Top connections cause a sharp bend on the hose, seriously shortening its life.
10. Store hose in a cool, dry, well-ventilated location away from direct sunlight.
11. Remove all sharp edges from hose fittings that might injure the tube in any way.
12. Where hose must withstand abrasive conditions, select a grade having highly abrasive resistant cover.

WATER HOSE—1. Do not use hose for pressures higher than that for which it is designed.
2. Never kink a hose to shut off water flow. When you do, the structure of the hose is weakened, eventually causing a break where the hose was kinked. Water flow should always be shut off at the connection end or nozzle end.

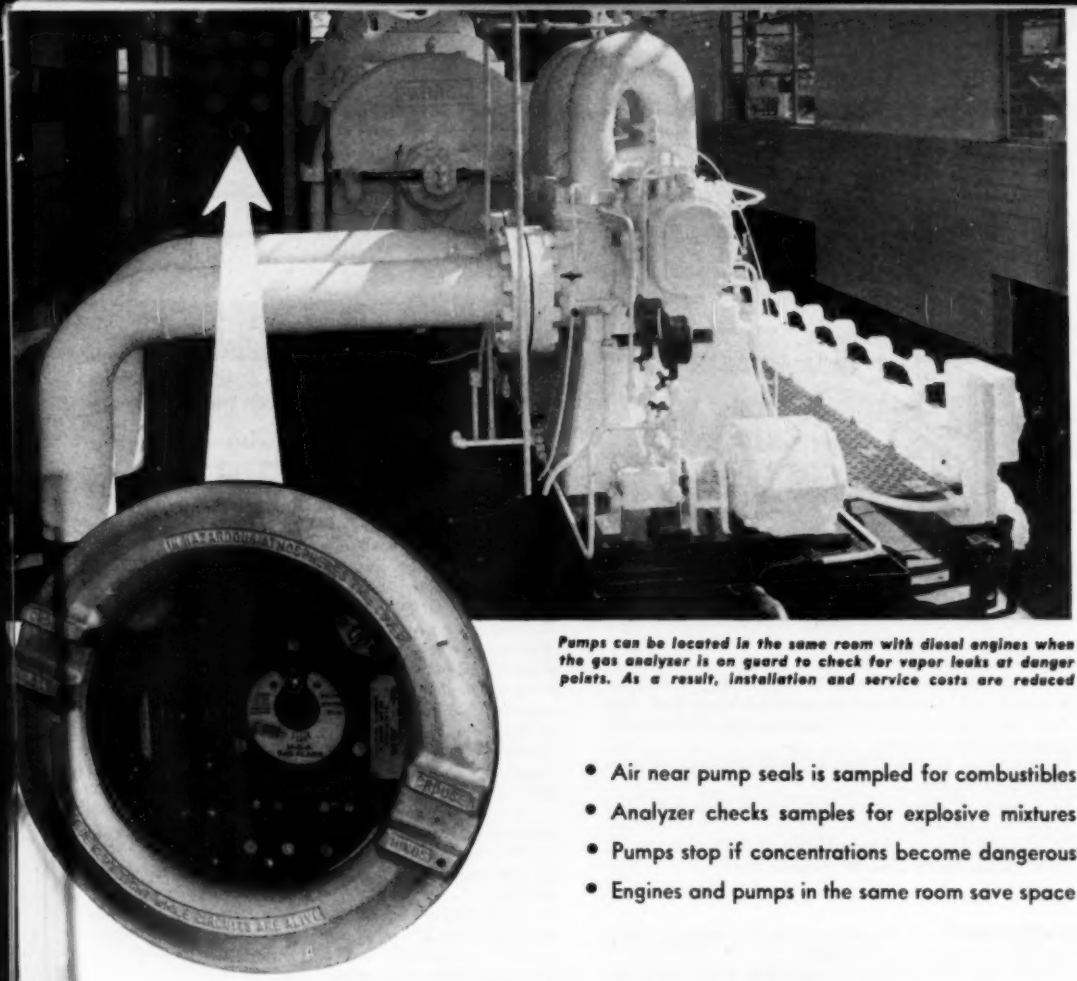
3. Do not expose hose to oil or grease. Hose that does come in contact with oil or grease should be scrubbed clean with plain water. Do not use soaps or detergents.
4. Avoid putting extreme strain on the hose. A swivel gooseneck connector will ease a great deal of strain and wear on the hose by preventing side bends and kinks.
5. Never drag or drop hose couplings. If you do, threads become battered and nicked or even fouled with dirt and sand, thus making them useless.
6. Do not hang hose over a nail when storing. Always use a rack or reel. Over a period of time, a nail will cut through the cover of the hose.
7. Store water hose in a cool, dry, well-ventilated location. If stored near heating systems, the rubber in the tubing rapidly dries out and cracks.
8. Protect hose where traffic will cross it. Use planks that are higher than the diameter of the hose.
9. Avoid letting the hose remain under pressure when not in use.
10. Drain hose before storing. This prevents mildew forming and general hose deterioration.
11. Do not dry hose in the sun on concrete roadways or sidewalks.

PACKINGS

1. Make sure that you use the correct type of packing for each installation.
2. Inspect all packing at least once a month. Look for stains where the packing is installed as they indicate leaks.
3. Examine every seam where packings are located to see that the edges are binding tightly.
4. Gaskets should be made from thinnest possible sheet consistent with surface conditions of flanges.
5. Check for surface cracking (surface oxidation) and watch for progressive deepening of cracks.
6. Have new packing available for complete overhaul.
7. Remove all foreign material from flange surfaces before applying packing.
8. Check all parts for trueness of faces against packing.
9. Keep complete records of inspection and repairs. Use these as basis of preventive measures to reduce frequency and cost of maintenance.
10. Inspect wear on objects that turn against the packing. A rough, grooved or eccentric sleeve or shaft shortens packing life.
11. For packing pump stuffing boxes, stagger packing ring joints 90 degrees or more apart so each joint is sealed by the adjacent packing ring.
12. Cut each ring so that its ends meet perfectly but do not overlap.
13. Total pressure should be equally distributed across the entire packing. The more nearly you can get equal distribution of total pressure, the longer will be the packing's life, other conditions being equal.
14. Repack the pump's entire stuffing box. Adding rings of packing to the stuffing box leads to excessive leakage.
15. Do not turn packing gland nuts up too tightly. This may cause the packing to bind.
16. Be sure gaskets are centered properly and in correct position before tightening bolts of flanges, etc.
17. For joints that must be opened frequently, it is sometimes desirable to use a dry lubricant, such as powdered graphite, talc, or mica to prevent adhesion and consequent damage to the gasket.

ACKNOWLEDGEMENT

● *Quaker Rubber Corporation, aware of the part industrial rubber products must play in America's drive to preserve freedom, has developed its "Conservation Maintenance Plan." It incorporates booklets, wall charts, informative memos and other data, all aimed at proper installation, utilization and maintenance of industrial rubber products. This article is based on Quaker's informative and instructive material, and the editors of INDUSTRY AND POWER gratefully acknowledge permission to publish it.*



Pumps can be located in the same room with diesel engines when the gas analyzer is on guard to check for vapor leaks at danger points. As a result, installation and service costs are reduced

- Air near pump seals is sampled for combustibles
- Analyzer checks samples for explosive mixtures
- Pumps stop if concentrations become dangerous
- Engines and pumps in the same room save space

SAFEGUARDS PUMPS FOR COMBUSTIBLES

CONTINUOUS AIR SAMPLING and analyzing instruments that detect combustible concentrations of vapors around seals on inflammable-liquid pumps allow installation of diesel engines and pumps in the same room, saving space and construction costs with greater convenience in operation and maintenance.

The system is installed in five diesel-powered pumping stations on one of the large oil lines serving the midwest section of the country.

In all, seventeen different products, from propane to aviation gasolines, are regularly piped through the 8-in. 250-mile pipeline which has a capacity of 33,000 barrels a day.

Suitable for analyzing most combustible gases and vapors, the alarms, a development of the Mine Safety Appliances Company, were considered advantageous for the pipeline pumps.

With explosion-proof case and flash-back arrestors, each analyzing unit is mounted on the main instrument panel. A turbo-compressor with explosion-proof motor draws air samples from the space around the double mechanical pump seals to the analyzer 25 ft away through $\frac{3}{8}$ in. copper tubing.

Two sensitized heated platinum filaments form a balanced electrical circuit in the instrument. One is sealed in a cell with uncontaminated air, the other exposed to the air sample. Combustibles present burn on contact with the hot wire, increasing its temperature and its electrical resistance. This unbalances the bridge circuit in proportion to concentration of combustibles, deflecting an indicating contact-making meter to energize an alarm when concentration exceeds the setting.

Energizing the gas alarm signal circuit operates a relay in the running circuit and shuts down the station completely. The analyzer is calibrated to energize the circuit when concentration reaches 60 per cent of the lower explosive limits. It also indicates presence of vapor concentrations by a red signal light on the main panel.

If the operator is not present when the station shuts down, drop in inlet pressure at the next station will be noticed. Maintenance men are notified when the condition warrants.

In the two years of operation, there have been about a dozen station shutdowns due to vapor-leak alarms. The system is tested monthly with gasoline-soaked rags held near analyzer intakes.

NEW SUN PRODUCT CLEANS HYDRAULIC SYSTEMS Without Downtime!

SUN'S NEW HYDRAULIC SYSTEM CLEANER eliminates the production loss and man-hour loss that usually go with the cleaning of equipment. This product does its work *without interrupting production*. It has the detergency to remove the sludges and gums formed by oxidation of hydraulic oil, soaps formed from coolants and cutting oils, and other contaminants. Besides permitting operations to go on undisturbed, it protects the system against further rusting once parts have been cleaned. Sun Hydraulic System Cleaner has been thoroughly "Job Proved" in cleaning up hydraulic systems of presses, machine tools, and circulating systems of a great variety of industrial equipment. It is available in viscosities suitable for any pump. Get peak performance out of *your* equipment by using Sun Hydraulic System Cleaner.

FREE!

To anyone who uses or maintains hydraulic equipment: this booklet by Sun Engineers on the fundamentals of hydraulic systems and the application of hydraulic oils. It will prove valuable as a guidebook in day-to-day work, a refresher course for engineers, or a readable instruction book for nonprofessionals.

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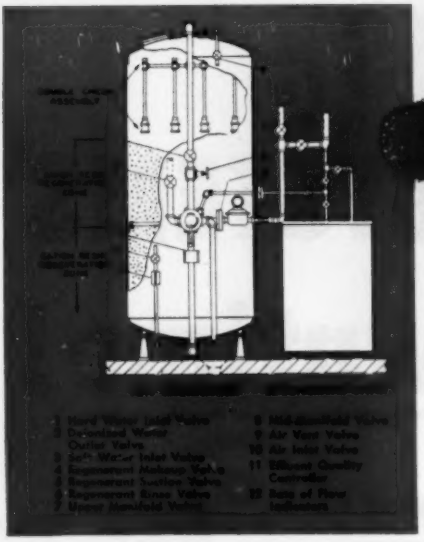

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(MonoFlo Design)

Only 18¢* per 1000 gallons compared with $5.00 per 1000 gallons for evaporated water

*Based on 10 grain water

SOME OF OUR OTHER PRODUCTS

- Zeolite Water Softeners
- Dealkalizers
- Silica Removers
- Degasitors
- Water Filters
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- Feedwater Treatment
- Chemical Feed Systems
- Iron Removal Equipment
- Water Treating Chemicals
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Write for Bulletins

Here is a truly revolutionary development—a single tank "monobed" deionizer that brings the cost of high quality demineralized water within the range of those who have heretofore found evaporated or distilled water prohibitive in cost. Here is the perfect boiler feedwater that assures freedom from scale, silica, CO_2 corrosion, carry-over and costly blowdown. Yet the overall cost is comparable with ordinary water conditioning systems.

The single column Elgin DeIonizer produces water of higher quality than delivered by two and four-column demineralizers. In fact, for nearly all purposes, the water is freer from impurities than *distilled* water — and at a fraction of the cost. Naturally the compact Elgin Ultra DeIonizer costs far less to buy and operate. It requires but little space — is simple in operation — cuts regeneration time and rinse water requirements — and has other notable Elgin features which make it today's outstanding deionizing equipment.

Similar in design, but utilizing different ion-exchange resins, the Elgin MonoFlo DeIonizer is used where complete silica and CO_2 removal are not required.

These DeIonizers incorporate the famous Elgin "Double Check" manifold assembly which permits the use of a deeper bed of ion-exchange resins without loss — giving a marked increase in demineralized water output.

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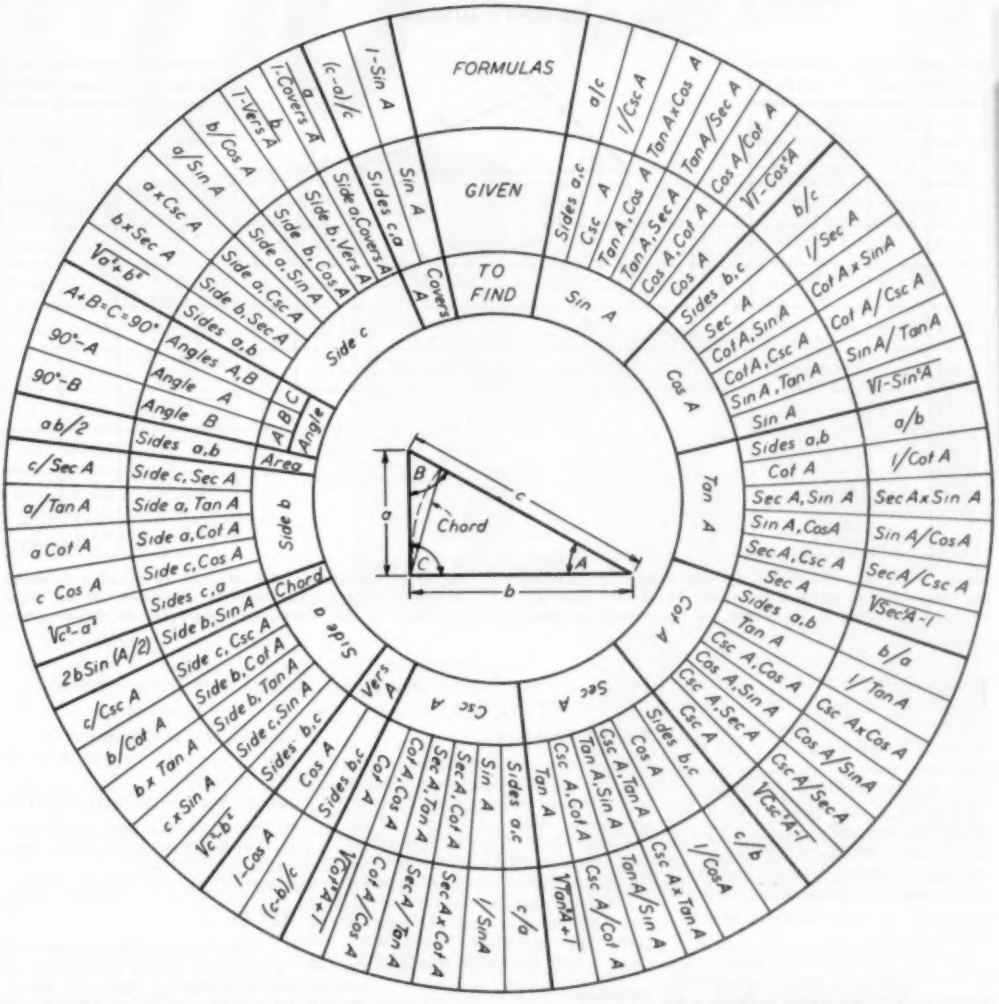
Water Conditioning Since 1908

Plant Engineer's Handbook

COMPILED BY GENE FELLER

TRIGONOMETRIC CALCULATIONS--I

JOSEPH T. HOGAN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Tan A, Cot A
Tan

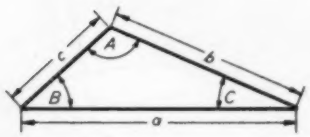
Plant Engineer's Handbook

COMPILED BY GENE FELLER

TRIGONOMETRIC CALCULATIONS—II

JOSEPH T. HOGAN

To find	Given	Formulas
A	B,C	$180°-(B+C)$
Tan A	a,b,C	$\frac{a \times \text{Sin } C}{b-(a \times \text{Cos } C)}$
Cos A	a,b,c	$\frac{b^2+c^2-a^2}{2bc}$
Sin A	a,c,C	$\frac{a \times \text{Sin } C}{c}$
Sin A	a,b,B	$\frac{a \times \text{Sin } B}{b}$
Tan A	a,c,B	$\frac{a \times \text{Sin } B}{c-(a \times \text{Cos } B)}$
B	A,C	$180°-(A+C)$
Sin B	a,b,A	$\frac{b \times \text{Sin } A}{a}$
Cos B	a,b,c	$\frac{c^2+a^2-b^2}{2ac}$
Tan B	b,c,A	$\frac{b \times \text{Sin } A}{c-(b \times \text{Cos } A)}$
Sin B	b,c,C	$\frac{b \times \text{Sin } C}{c}$



To find	Given	FORMULAS	
a	c,A,C	$\frac{c \times \text{Sin } A}{\text{Sin } C}$	$\frac{a \times \text{Sin } B}{\text{Sin } A}$
a	b,A,B	$\frac{b \times \text{Sin } A}{\text{Sin } B}$	$\frac{c \times \text{Sin } B}{\text{Sin } C}$
a	b,c,A	$\sqrt{b^2+c^2-(2bc \times \text{Cos } A)}$	$\sqrt{c^2+a^2-(2ac \times \text{Cos } B)}$

Given	To find	Formulas
A,B	C	$180°-(A+B)$
a,c,A	Sin C	$\frac{c \times \text{Sin } A}{a}$
b,c,A	Tan C	$\frac{c \times \text{Sin } A}{b-(c \times \text{Cos } A)}$
b,c,B	Sin C	$\frac{c \times \text{Sin } B}{b}$
a,c,B	Tan C	$\frac{c \times \text{Sin } B}{a-(c \times \text{Cos } B)}$
a,b,c	Cos C	$\frac{a^2+b^2-c^2}{2ab}$
a,A,C	c	$\frac{a \times \text{Sin } C}{\text{Sin } A}$
a,b,C	c	$\sqrt{a^2+b^2-(2ab \times \text{Cos } C)}$
b,B,C	c	$\frac{b \times \text{Sin } C}{\text{Sin } B}$
a,b,C	Area	$\frac{ab \times \text{Sin } C}{2}$
a,b,c	Area	$\sqrt{S(S-a)(S-b)(S-c)}$ where $S=\frac{1}{2}(a+b+c)$

Arranged in this chart are the functional relationships and identities of oblique triangles; those for right triangles are shown in the chart on the preceding page.

Use of the charts is best effected by drawing a sketch of the triangles approximately to scale, letter them as shown in the charts, and designate all known parts

ENGINEERING calculations requiring the use of trigonometric functions are facilitated by the use of the charts shown on this page and the preceding page. Reference to them yields the proper formula for use in the solution of any triangle when it is required to compute a particular function or part. Wherever possible, the formulas have been expressed in forms which permit use of logarithms or the slide rule; in many instances, this is advantageous.

The "parts" of a plane triangle are its three sides *a*, *b*, *c*, and its three angles *A*, *B*, *C*, (*A* being opposite *a*, *B* opposite *b*, *C* opposite *c*, and $A+B+C=180$ deg). A triangle is, in general, determined by any three parts which are not all angles.

Sample Problem

As an illustration of the use of the chart, consider the following problem. It is customary in sheet-metal design to specify the length of chord and the radius for the layout of circular sectors to be used in metal hopper or cone fabrication. For a particular hopper, it is calculated that the sheet-metal pattern is to consist of a circular sector of radius 60 in. and angle 150 deg. What chord length should be specified?

Solution

Reference to the chart on the preceding page shows that the length of chord is given by the relationship

$$2b \text{ Sin } (A/2)$$

Therefore, since $b=60$ in. and $(A/2)$ equals 150 /2 or 75 deg, then the length of chord is

$$2 \times 60 \times \text{Sin } 75 \text{ deg} = 120 \times 0.966 = 115.9 \text{ in.}$$

The layout pattern is thus specified as a circular sector of radius 60 in. and chord length 115.9 in.

LET US . . .

. . . present your ideas on these pages. Rate of pay is based on the engineering value of the idea, with a minimum of $15 for smaller-than-page items.

KIRK & BLUM FUME CONTROL SYSTEM

60% More Air Less H.P. Lower Cost

at Estate Heatrola Div., Noma Electric Corp. HAMILTON, OHIO

• Although a conventional duct system would have required as much as 100 H. P., this KIRK & BLUM *ductless* Fume Removal System uses just 40 H. P. to handle 160,000 cubic feet of air per minute . . . doing an excellent job of fume removal at lower initial cost and lower operating cost.

In the plant of this noted stove manufacturer, a battery of ten 8-foot tanks are ventilated by the fume exhaust system shown. Flexibility of capacity is obtained by operation of one or more fans as production requires. Even when baskets containing the parts are lifted from the tanks, the system easily removes all steam and fumes.

Completely designed, fabricated and installed by KIRK & BLUM, this Fume Control System is another example of engineering skill and experience combined to save money for a long list of America's leading plants. For a comprehensive picture of KIRK & BLUM Fume Control Systems, write today for Booklet, "Dust Collecting Systems for Metal Industries".

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FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM
FUME CONTROL SYSTEMS

Spot News

Short, "boiled-down" paragraphs on the most interesting recent events and developments in American industrial plants.

Recommends Standards for Weldless Chain and Chain Products

A proposed "Simplified Practice Recommendation for Weldless Chain and Chain Products" has been submitted by the government to producers, distributers and users of these products for acceptance or comment. The recommendation was proposed by the Chain Institute, Inc., and consists of a simplified list of kinds and sizes of weldless chain and chain products that currently are in general use and demand, and are regarded as affording an adequate selection for ordinary use and for stock. It shows in addition to sizes, the recommended finishes for 26 items of chain and chain products covered by the recommendation.

Mimeographed copies of the Proposed Recommendation for Weldless Chain and Chain Products may be obtained from the Commodity Standards Division, Office of Industry and Commerce, Washington 25, D. C.

Pipeline Transmitting Gas From Texas To New England Requires 11 New Pumping Stations

Construction is now underway on Texas Eastern Transmission Corp.'s new 791-mile pipeline; 30 in. in dia, it will increase Texas Eastern's peak day delivery capacity from 740,000,000 to 1,205,700,000 cu ft of natural gas. Approximately 220,000,000 cu ft daily is destined for Algonquin Gas Transmission Co. for resale to utilities in Connecticut, Rhode Island and Massachusetts, including Boston.

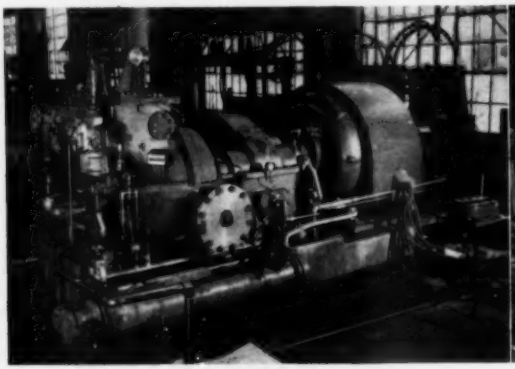
Seven compressor stations will be built on the new pipeline, while six stations will be added to the present Texas Eastern System east of Connellsville, Pa. These stations, aggregating 98,000 hp., will increase the gas-pumping power of the entire system to a total of 376,300 hp.

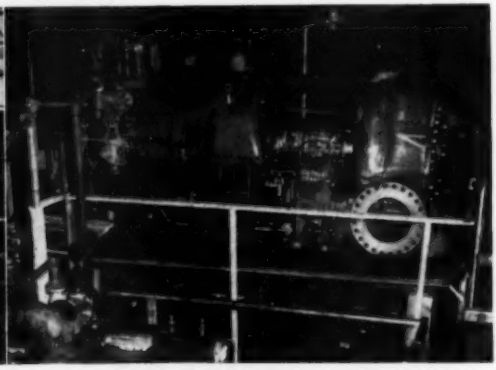
Transcontinental Gas Pipeline Corp. is also increasing capacity of its eastbound gas lines. Three 5,000-hp. De Laval steam-driven centrifugal compressors will deliver 603,190,000 cu ft of gas per day through Transco's booster station No. 7 near McComb, Miss. One of the turbine-driven compressors — an innovation in gas-line pumping service— is shown in one of the illustrations below. Also shown on test is one of six 800-kw De Laval turbine generators built for Trasco. Two of these units will supply station power in each of the three booster stations using the turbine-driven compressors. Steam conditions are 600 psig, 750 F, 20 psig back pressure. Electrical output is 480 v, three phase, 60 cycles.

Diorama Display Pictures Extent of Corporation's Service to Industry

The importance of automatic combustion control to public utility and industrial power plants is stressed in an activated diorama in the new reception room of the Hagan Building, Pittsburgh, Pa. Sponsored by the Hagan Corp. and its subsidiaries, Hall Laboratories, Inc., and Calgan, Inc., the diorama and accompanying displays are intended to indicate the wide variety of industries served by these companies. It shows the miniature buildings of a model city, including a light and power plant, a city steam plant and a wide variety of industrial plants. The pages of a history book, turning before the visitor's eyes, record that the Hagan Corp. founded in 1918, developed the first automatic combustion controls for stationary steam boilers, and that today Hagan equipment controls automatically the boilers in many of the nation's largest power plants.

Successive pages are devoted to the founding of Hall Laboratories, Inc., in 1925, and Calgon, Inc., in 1934. Both



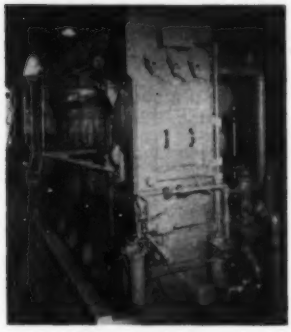


Three 5000-hp steam-turbine-driven centrifugal compressors are to be added to booster stations in transcontinental gas line. At right is shown one of the units on test at the De Laval plant in Trenton, N. J. At the left is shown one of six De Laval turbine generators that will be installed in pairs for power generation at these stations

serve power plants, Hall as industrial water consultants, and Calgon as the manufacturer of the glassy phosphates used in water treatment.

Ohio Municipal Power Plant Installs 1080-Hp Dual-Fuel Diesel

Illustrated here is the 31-ton Superior dual-fuel supercharged diesel engine sent to Arcanum, Ohio, from The National Supply Co.'s Engine Div. plant at Springfield, Ohio. The engine, which develops 1080 hp at 360 rpm, is



This 1080-hp 360-rpm dual-fuel diesel is now augmenting other diesel generators at Arcanum, Ohio, municipal power plant

being installed in the Municipal Light and Power Plant at Arcanum where it will operate next to an 800-hp Superior engine installed in February, 1946. Three trucks were required to transport the engine, its 6850-lb flywheel, 1620-lb turbo-charger, and the remaining auxiliary parts.

Steel Mill Improves Treated Water System and Adds Three 63,000-GPM Pumps

Three large pumps with a total capacity of 63,000 gpm will be installed by the Machinery Div. of Dravo Corp. for the new openhearth furnace plant at the Pittsburgh Works of Jones & Laughlin Steel Corp. The pumps will be housed in a reinforced concrete structure along the shore of the Monongahela River. Construction of this river intake within a sheet-steel cofferdam has already been started. Each of three De Laval pumps will be driven by a 1250-hp electric motor. Water from the river will be screened, strained and treated before being pumped into the mill's piping system.

At J. & L.'s Aliquippa Works, Dravo's Contracting Div. will construct a new coal unloading dock extending some 1650 ft along the Ohio River bank. Included in this project is a 466-ft steel pile wharf with a central reinforced concrete pier for support of coal unloading machinery. Also to be installed are seven sheet-steel mooring cylinders 16 ft in dia and three ice breaker cylinders 25 ft in dia.

Production of Heavy Power Equipment Now Under Government Control

The Government announced recently that it will direct the production of heavy equipment used by the electric power industry. The National Production Authority issued an order, designated M-44, requiring all producers of heavy power equipment costing $5,000 or more to report monthly the orders they have on hand and their production and delivery schedules. The N.P.A. said it will use this infor-

(Continued on page 128)

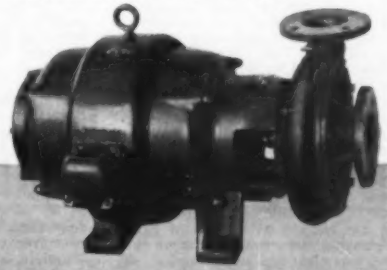
know the nicest guy in the world who's

ALWAYS LOOKING FOR TROUBLE

YOUR WEINMAN REPRESENTATIVE...

. . . definitely no trouble maker, but trouble *is* his business. Any plant with liquid handling difficulties needs his advice and his product. He sells Centrifugal Pumps but he offers much more than that. He offers specialized experience. The organization backing him has concentrated on ONE product for more than half a century. Each pump application and installation is custom-made for the job to be done. Thousands of WEINMAN pumps are successfully preventing trouble today.

Why not talk Pumps with WEINMAN? WEINMAN'S knowledge will save you money and worry. The WEINMAN representative is ready to talk facts and figures whenever, wherever you say. Just write, wire or phone.



WEINMAN General Service Unipump is compact enough to be used where space is limited. It is sturdy and operates economically. Works against heads up to 500 feet. Capacity up to 1000 G.P.M.

REPRESENTATIVES IN PRINCIPAL CITIES

The WEINMAN Pump Mfg. Co

readers' guide to advertised products

Here you'll find, briefly reviewed, all the booklets and leaflets offered in the advertising columns of this issue of INDUSTRY AND POWER. For easy reference, this listing is divided into various classifications of products. To get your free copies of literature described here and in the corresponding advertisements, turn to Page 101 for a postage-free order card. There, list the Key Numbers of the paragraphs below and mail.

AIR & DUST FILTERS & COLLECTORS

500—See page 95. Dust and Fume Control Systems: Send for free booklet, "Dust Collecting Systems in Metal Industries". Shows typical installations and exact data that will help you concontrol these problems better in your own plant. Kirk and Blum Mfg. Co.

ANTI-CORROSIVE & PROTECTIVE COATINGS

501—See page 4. Rust Preventive: Rust-Oleum seals metal so that no rust-causing oxygen can reach it. Available in a full range of colors. Write for complete catalog. Rust-Oleum Corp.

BOILERS & BOILER ACCESSORIES

502—See page 125. Firebox Type Boilers: Especially adapted for high pressure—10 to 304 hp, 100, 125, 150 lb wp. Send for full information and free 6 in. scale with pipe diameter markings. Kewanee Boiler Corp.

503—See page 135. Steam Generators: Wickes can fill your exact requirements for boilers of any type up to 250,000 lbs steam per hour and 850 psi. Write for descriptive literature on the famous Wickes line of steam generators. The Wickes Boiler Co.

BUILDING HEATING, VENTILATING & AIR CONDITIONING

504—See page 34. Unit Heaters: Trane unit heaters now feature a new, completely adjustable Louver Fin Diffuser for an infinite number of diffusion pattern possibilities. Write for additional information on this new easy way to control air flow. The Trane Company.

505—See page 120. Heating Equipment: Hajoca Corporation takes pleasure in announcing it is now handling the complete Dunham line of top quality heating equipment—two well-known firms combined to give you one great service. Hajoca Corporation.

506—See page 27. Information on Blowers: See page 27 for brief data on Coppus "Blue Ribbon" Ventilators. Please use coupon at bottom of page for requesting more information on the blowers that clear the air for action, or for any special ventilating problem you may have. Coppus Engineering Corp.

507—See page 51. Air Heaters: Recommended for pre-heating, drying, dehydrating, stress relieving, controlling atmospheres and delivering air for combustion. The design is radically new and different. Write today for complete data. John Zink Company.

BUILDING MATERIALS & MAINTENANCE

508—See page 131. Portable Electric Blower: Protect motors and other equipment from burnouts and bearing failure by removing dangerous dust, dirt and lint. Write for Bulletin 579 for complete information on the TORNADO. Breuer Electric Mfg. Co.

509—See page 122. Maintenance Equipment: Write for free 40-page handbook on Commutator and Slip Ring Maintenance and full information on resurfacers, precision grinders, undercutters, flexible abrasive. Send coupon today. Ideal Industries.

510—See page 127. Free Repair Handbook: 40 pages describing Smooth-On repairs that can save you time and money. 170 illustrations. Write for your free copy now. Smooth-On Mfg. Co.

511—See page 131. Instant-Use Floor Patch: Tough, plastic material which restores broken concrete to solid smoothness. Run traffic over it immediately. Write for details of free trial offer and "Hand Book of Building Maintenance". Flexrock Co.

512—See page 115. Vacuum Cleaning Units: Write for Spencer Bulletin No. 144, gives complete information on Spencer stationary vacuum cleaning units—handle hot materials, liquids, sand, rice, injurious dusts and gases. Pay for themselves in a few months. Spencer Turbine Company.

513—See page 120. Pipe Joint Sealing Compounds: Pipe joints and fittings sealed with Key sealing compounds do not leak. Connections will not freeze and reopening is easy. Send for free sample. Key Company.

514—See page 121. Vacuum Cleaning Systems: Check these free bulletins: A-794 on 5 hp Hoffco-Vac No. 50 Portable; A-803 on the new Gas-Engine Powered Hoffco-Vac No. 50 Portable; A-752 on 3 hp Hoffco-Vac No. 30. See details on page 121. U. S. Hoffman Machinery Corp.

515—See page 127. Portable Vacuum Cleaner: Tornado cleaner saves time, cuts maintenance costs, can be operated by inexperienced personnel. Free demonstration if wanted. Write for your free copy of Bulletin 600-IP for complete details. Breuer Electric Mfg. Co.

516—See page 124. Combination Blower-Suction Cleaner: It's a snap to rid all of your equipment of damaging dirt, dust, and grit with portable cleaning tool. Write for more data. Clements Mfg. Co.

CINDER & FLY ASH EQUIPMENT

517—See page 54. Fly-Ash Collector: Buell van Tongeran Cyclones can help you do a real job of fly-ash collection on pulverized coal-fired boilers. If you have a serious flyash problem, an inquiry will bring help in a hurry. Buell Engineering Company.

COAL, ASH & BULK HANDLING

518—See page 22. Belt Conveyors: The only organization offering you complete belt conveyor "package": engineering, specialized machinery and belting. Whenever the handling of bulk materials is your problem, you are invited to submit your problem concerning the handling of bulk materials without obligation. Hewitt-Robins Incorporated, Robins Conveyor Division.

519—See page 116. Coal and Ash Handling Equipment: Complete installations designed, manufactured, and installed by Beaumont. For full advantages write for your copy of folder of typical installations. Beaumont Birch Company.

520—See page 103. Airslide Conveyor: In this system, dry pulverized materials are aerated or fluidized and made to flow like water. Completely enclosed to eliminate danger of contamination. Dusting is eliminated. Only power required is low pressure air. Saves time and space. Write for complete details. Fuller Company.

COMPRESSORS

521—See page 111. Schramm Unit System: See page 111 for some of the advantages of installing Schramm air compressors as a "unit system". Then for full details on how the "unit system" will give you definite savings, write today to Schramm, Inc.

600—See page 134. O-CE Air Compressors: Write for Bulletin 726-5 covering these motor-driven compressors in sizes up to 2000 hp—first horizontal duplex, side crank compressors to have anti-friction roller bearings throughout. Chicago Pneumatic Tool Company.

CONTROLS, REGULATORS & INSTRUMENTS

522—See page 131. Temperature Regulators: Write for Stacon Bulletin 50-100 for full details on extra sensitive, accurate, economical temperature regulators. Farris Stacon Corporation.

523—See page 118. Boiler Feed Water Meters: Send for details on Henszey meters that provide dependable, accurate measurement of boiler feed water, boiler blowdown, condensate, chemicals, and other similar liquids. Henszey Co.

524—See page 42. Regulators and Controls: Sarco equipment insures increased output at lower costs. For expert help with your controlling and regulator problems, write Sarco today. Sarco Company, Inc.

525—See page 13. Jacket Water Tem-

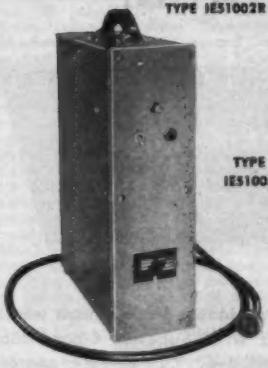
(Continued on page 101)

FOR MAXIMUM PERFORMANCE AND LONG LIFE
OF ELECTRICALLY-OPERATED EQUIPMENT

Invest in STABILINE

Automatic
VOLTAGE REGULATORS

TYPE IES1002R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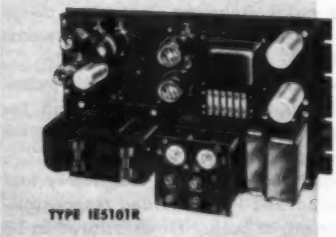
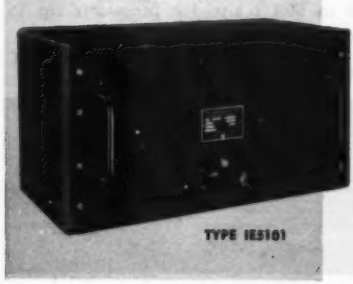

TYPE IES101R


TYPE IES101

Manufacturers faced with the need for increased production and lower costs are becoming extremely conscious of the importance of maintaining constant voltage to electrical apparatus. The Superior Electric Company's line of STABILINE Automatic Voltage Regulators offers equipment to suit the needs of each application. Two types are available: Type IE (Instantaneous Electronic) and Type EM (Electro-Mechanical).

STABILINE Type IE is a completely electronic unit with no moving parts . . . is used where instantaneous and extremely close correction is required. It maintains a constant output voltage regardless of line variations at no load, full load or any intermediate load. The output voltage is held to within ± 0.1 volts of nominal for wide line variations; within ± 0.15 volts of nominal for any load current change or load power factor change from lagging .5 to leading .9. Maximum waveform distortion never exceeds 3%.

Standard models are available in cabinets or for relay rack mounting in numerous ratings as listed below. In the event you have a special requirement involving other frequencies or ratings, SECO voltage control engineers will study your specific problem and make recommendations without obligation.

INSTANTANEOUS ELECTRONIC CABINET MODELS

Input Voltage Range	Output Voltage Range	Frequency In Cycles	Load Range In Amperes	Load Power Factor Range	Rated Output KVA	Type
95-135	110-120	60 ± 10%	0 - 2.2	.5 lagging to .9 leading	0.25	IE51002*
195-255	220-240	60 ± 10%	0 - 1.1		0.25	IE52002*
95-135	110-120	60 ± 10%	0 - 4.5		0.5	IE5100S*
195-255	220-240	60 ± 10%	0 - 2.2		0.5	IE52005*
95-135	110-120	50 ± 10%	0 - 4.5		0.5	IEL5100S*
195-255	220-240	50 ± 10%	0 - 2.2		0.5	IEL5200S*
95-135	110-120	60 ± 10%	0 - 8.5		1.0	IE5101*
195-255	220-240	60 ± 10%	0 - 4.5		1.0	IE5201*
95-135	110-120	50 ± 10%	0 - 8.5		1.0	IEL5101*
195-255	220-240	50 ± 10%	0 - 4.5		1.0	IEL5201*
95-135	110-120	60 ± 10%	0 - 22.0		2.5	IE5102*
195-255	220-240	60 ± 10%	0 - 11.0		2.5	IE5202*
195-255	220-240	50 ± 10%	0 - 11.0		2.5	IEL5202*
95-135	110-120	60 ± 10%	0 - 43.5		5.0	IE5105
195-255	220-240	60 ± 10%	0 - 22.0		5.0	IE5205

* Also offered in rack models.

REMEMBER, STABILINE TYPE EM (ELECTRO-MECHANICAL) UNITS ARE ALSO AVAILABLE. RATINGS FROM 2 TO 100 KVA. LITERATURE ON REQUEST.

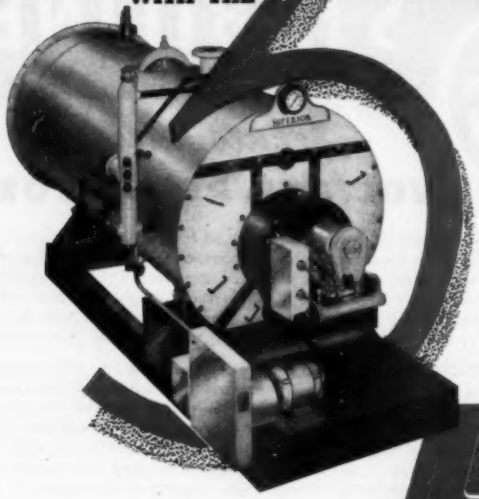
There's a STABILINE Automatic Voltage Regulator for every need. Send today for literature and specific information. Write The Superior Electric Co., 1504 Church St., Bristol, Conn.

THE SUPERIOR ELECTRIC CO.
BRISTOL, CONNECTICUT

POWERSTAT VARIABLE TRANSFORMERS • VOLTBOX A-C POWER SUPPLIES • STABILINE VOLTAGE REGULATORS

CAPACITY OPERATION *Easily*

WITH THE



Sq. Ft.

OF HEATING SURFACE
PER B.H.P.
IN EVERY

SUPERIOR
STEAM GENERATOR

A good steam generator doesn't have to be pushed . . . it attains its maximum rated capacity with ease. Superior Steam Generators do just this and at thermal efficiencies in excess of 80% under field operating conditions. One of the main factors contributing to their full capacity operation at high efficiencies is the five square feet of heating surface per b.h.p. in every Superior Steam Generator.

High efficiencies developed on the job result in lower fuel costs. These same high efficiencies developed easily without pushing the steam generator result in lower maintenance costs and longer boiler life. The final result of course, is lower steam costs.

There are other features which contribute to the outstanding performance of Superior Steam Generators . . . multiple-fan induced down-draft which is built-in, combined with Superior 4-pass construction for higher efficiency . . . large evaporating surface for quick steaming . . . large steam space and dry pan to assure ample reserve steam capacity and 99.5% dry steam at the nozzle . . . and many other important features, each painstakingly developed through experience and research, to make a Superior Steam Generator the unit to cut your steam costs.

Superior Steam Generators are completely factory assembled, backed by undivided responsibility. Burn gas or oil, or both. Manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water.

Write today for the details in Catalog 302.

Superior Combustion Industries, Inc.

Factory: Emmaus, Pa.
Executive Offices: Times Tower, Times Square, New York 18, N. Y.

readers' guide to advertised products

(Continued from page 98)

perature Control: See page 13 for a list of important advantages that quickly pay back the cost of Powers self-operating and pneumatic controls for air compressors, diesel and gas engines. Have a Powers engineer call to study your requirements for better jacket water temperature control. No obligation. The Powers Regulator Co.

526—See page 119. All-Metal Thermometers: Write for Bulletin T-13 on these easy-to-read, ruggedly constructed thermometers for most industrial applications. Wide variety of types. Weston Electrical Instrument Corporation.

527—See page 109. Pressure Regulators: Masoneilan reducing valves cut waste, costs and save money by holding pressures within required limits without constant maintenance. No. 11 for steam service, has maximum working pressure 250 psi. No. 227 for water service, has maximum working pressure 150 psi. Write for full details. Mason-Neilan Regulator Company.

528—See page 58. Pressure and Temperature Regulators: Write for Bulletin 350. Spence gives full data on Spence Regulators. They operate at low unit stress for long life, cut down maintenance cost. Spence Engineering Company, Inc.

529—See page 120. Automatic Controls: Write for Catalog No. 700 for information and data on this complete line of automatic controls for heating, air conditioning, refrigeration and various industrial applications. Mercoid Corp.

530—See page 120. Automatic Liquid Measuring Gages: Write for complete details on liquid level gages for measuring liquids of all kinds. Dial readings in feet, inches, gallons, pounds or any desired unit. The Liquidometer Corp.

DIESELS

531—See page 49. New "V-Design": Offers double the power in practically the same space, while retaining the exceptional stamina, high efficiency and low maintenance characteristic of LS operation. Write for more details. The Cooper-Bessemer Corp.

ELECTRICAL DISTRIBUTION

532—See page 99. Stabiline Automatic Voltage Regulators: Two types are available: Type IE (Instantáneous Electronic) and Type EM (Electro-Mechanical). Send today for literature and specific information. The Superior Electric Co.

533—See page 39. Sealtite Flexible Conduit: The ideal flexible electrical conduit for wiring on machines, motors, controls, etc.; for protecting wiring against water, oil, grease chemicals or abrasion. For detailed information or literature on Sealtite, write today. American Metal Hose Branch, The American Brass Company.

FANS & BLOWERS

534—See page 2. Fans and Blowers: Hartzell systems remain trouble-free year after year; keep operating costs at minimum. Send coupon for free information or free consultation with Hartzell field representative. Hartzell Propeller Fan Co.

FUELS & FIRING EQUIPMENT

535—See page 56. Fuel oil Additive: Houghto-Solv dissolves all the sludge in your entire system—cleans tanks, lines, strainers, pumps, nozzles, etc. Write for free descriptive folder today. E. F. Houghton & Co.

536—See pages 28, 29. New "50" Series Riley Pulverizer: Tungsten carbide facings on pulverizer parts give you long periods continuous operation, low maintenance, sustained fineness. No capacity reduction with high moisture coals and complete reliability. Write today for detailed information. Riley Stoker Corporation.

537—See page 108. Remote Dispensing Systems: Designed for accurately measured deliveries of such non-corrosive liquids as gasoline, benzine, kerosene, diesel oil. Complete information on the adaptability of these systems for special applications, and descriptive bulletin will be mailed immediately upon request. Gilbert & Barker Manufacturing Company.

HEAT EXCHANGER EQUIPMENT

538—See page 129. Instantaneous Water Heaters: Engineered for all industrial needs. Provides hot water instantly at the temperature required in the volume needed. Write for complete engineering details and specifications. Pick Manufacturing Co.

539—See page 52. Refrigeration Condensers: Free Bulletin RC-1 gives you complete details on horizontal and vertical types shell and tube condensers for every service. Be sure to write today. Henry Vogt Machine Company.

540—See page 17. Chromalox Immersion Heaters: Request the fully illustrated booklet "100 Ways to Apply Electric Heat". It contains photographs and drawings showing Chromalox Electric Heaters at work in plants throughout the United States. Write today for your free copy. Edwin L. Wiegand Co.

LUBRICANTS, LUBRICATION, OIL FILTERS & PURIFIERS

541—See page 116. Non-Fluid Oil: Send for instructive bulletin and free testing sample of Non-Fluid Oil for positive bearing protection. New York

Use these postage-free cards to order booklets and catalogs from advertisers, new bulletins and new equipment literature. List key numbers of the paragraphs describing the items you want in the spaces provided on cards below.

To: INDUSTRY AND POWER, St. Joseph, Michigan **April, 1951**

Please have forwarded to me, at no obligation, the literature I've indicated by the following Key Numbers:

Inquiries for items listed in this issue not serviced beyond Aug. 1, 1951

Advertised Products Numbers begins Page 98	*New Equipment Numbers begins Page 10*	*New Bulletin Numbers begins Page 26*

Your Name_____ **Title**_____

Your Company_____

Co. Address (St. & No.)_____

City_____ **State**_____

FIRST CLASS PERMIT No. 19 (Sec. 34.9, P.L.&R.) ST. JOSEPH, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2¢—POSTAGE WILL BE PAID BY

INDUSTRY and POWER

MAUJER PUBLISHING CO.

ST. JOSEPH, MICH.

& New Jersey Lubricant Company.

542—See pages 24, 25. Sinclair Rubilene Oils: Rubilene resists oxidation; retards the formation of damaging acidic compounds, gum and sludge; is nonfoaming. Additional information on request. Sinclair Refining Co.

543—See page 124. Lubriplate: Write today for authentic information on how these lubricants effect maximum savings even in unusually severe lubrication problems. Fisk Brothers Refining Company, Lubriplate Division.

544—See pages 14,15. Lower Lubrication Costs: Refer to coupon on pages 14, 15 to request a "Desk-Top Demonstration" of Oil-Mist. This entails no cost or obligation on your part. There is also space to check for additional information about Oil-Mist by mail. Alemite, Division of Stewart-Warner.

545—See page 91. New Hydraulic System Cleaner: Use coupon on page 91 to request your free copy of "Hydraulic Fundamentals and Industrial Hydraulic Oils" specially prepared for you by Sun Engineers. On the fundamentals of hydraulic systems and the application of hydraulic oils. Also request additional information about Sun Hydraulic System Cleaner on same coupon. Sun Oil Company.

546—See page 112. Lubricants: Ask for your free copy of the Albany Recommendation Chart. It's helpful and informative. Adam Cook's Sons, Inc.

547—See pages 35, 36. Nonpareil and Stanoil: Write for full information on Nonpareil Turbine Oil. Low-acidity operation eliminates need for treating oil or cleaning turbine oil systems. Check with your nearest local Standard Oil office and let their lubrication specialist give you the facts on Stanoil Industrial Oil, too. Or write for additional data. Standard Oil Company (Indiana.)

MAGNETIC SEPARATORS

548—See page 41. Do You Have a Contamination Or A Separation Problem: Look on page 41 for successful solutions to a variety of contamination and separation problems. Note the coupon at the bottom of this advertisement which offers you free literature. Eriez Manufacturing Company.

549—See page 123. Magnetic Starters: Write for Free Folder G-7005 on Arrow-Hart magnetic starters. High arc resistance, ease of wire and servicing, balancing mechanism cuts space in half. The Arrow-Hart & Hegeman Electric Co.

MECHANICAL POWER TRANSMISSION

550—See page 21. Condor V-Belts: Bulletin 6868D describes all advantages of these Whipcord V-Belts—less stretch on your drive, grip pulleys snugly and deliver positive power. Write today. Raybestos-Manhattan, Inc.

551—See page 3. Compass Belt: Goodyear compass belts proved to give 8 times longer service. Write for full information. Goodyear Tire & Rubber Company.

552—See page 43. Multi-V-Drives: Advertisement describes 5 features to look for when buying V-belt drives. Write for Bulletin No. V-1400-B7F for full details on Worthington Multi-V-Drives and QD Sheaves. Send coupon today. Worthington Pump & Machinery Corp.

MOTORS & GENERATORS

553—See page 118. Tube Expanders: Write for Bulletin No. 204-C giving complete information of these Wiedeke triple-purpose ideal tube expanders for B&W and similar boilers. The Gustave Wiedeke Company.

PACKAGED STEAM GENERATORS

554—See page 50. Steam-Pak Generator: Steam-Pak Generators are built in capacities from 15 hp up, for low or high pressure, steam or hot water, for light or heavy oil, combination gas and oil, or straight gas. Write for complete data. York-Shipley, Inc.

555—See page 129. Packaged Steam Generators: Write for Catalog IP451 for tested data to show how you can reduce your steam costs with a Dutton "Packaged" Steam Generator. Hapman-Dutton Company, Dutton Boiler Div.

556—See page 100. Packaged Steam Generators: New fully illustrated Catalog 302 gives complete details for units available in 18 sizes. Write today. Superior Combustion Industries, Inc.

557—See page 7. Preferred Unit Steam Generator: Check important features of Preferred Unit Steam Generators that assure efficient economical service for an average of 25 years. Write for Bulletin with details. Preferred Utilities Mfg. Corp.

558—See page 31. Forced Recirculation Steam Generators: See page 31 for outstanding features of this Clayton self-contained steam plant. Use the coupon to request a desk demonstration of Clayton Forced Recirculation principle and/or catalog. Clayton Manufacturing Company.

PACKING & GASKETS

559—See page 45. Navalon Packings: Made of "ramie", these packings give service against fresh or salt water, brine, cold oil, and for use on pumps, elevators, etc. Write for Folder PK-32A. Johns-Manville.

560—See page 114. Durametallic Packings: See page 114 for results of successful test on Durametallic No. 777 NMT. Complete information on this or other types of Durametallic Packings for valve and pump requirements, simply request Bulletin No. IP-428. Durametallic Corporation.

(Continued on page 104)

Use these postage-free cards to order booklets and catalogs from advertisers, new bulletins and new equipment literature. List key numbers of the paragraphs describing the items you want in the spaces provided on cards below.

FIRST CLASS PERMIT No. 19 (Sec. 34.9, P.L.&R.) ST. JOSEPH, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2¢—POSTAGE WILL BE PAID BY

INDUSTRY and POWER

MAUJER PUBLISHING CO.

ST. JOSEPH, MICH.

To: INDUSTRY AND POWER, St. Joseph, Michigan **April, 1951**

Please have forwarded to me, at no obligation, the literature I've indicated by the following Key Numbers:

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Advertised Products Numbers begins Page 98	*New Equipment Numbers begins Page 10*	*New Bulletin Numbers begins Page 26*

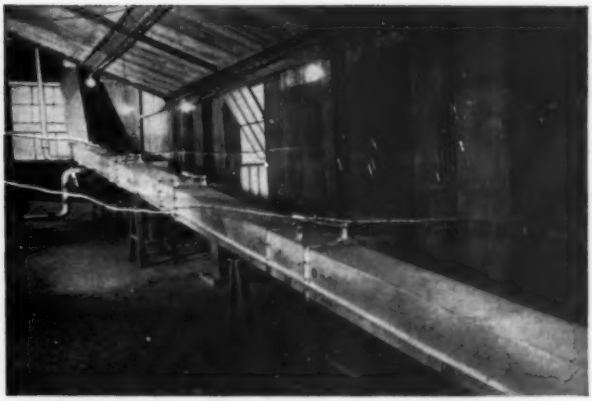
Your Name_____ **Title**_____

Your Company_____

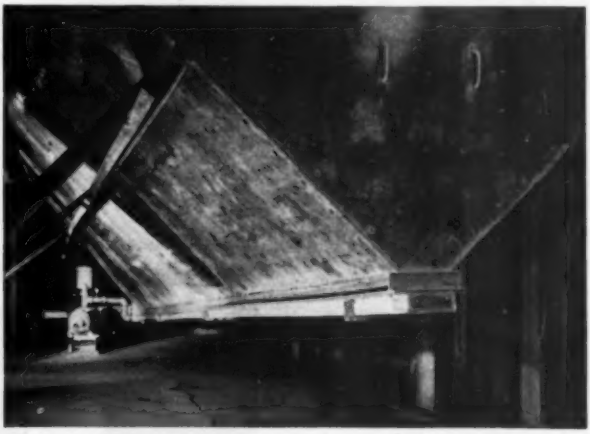
Co. Address (St. & No.)_____

City_____ **State**_____

AIRSLIDE MAKES "EASY-GOING" FOR PULVERIZED MATERIALS



F-H Airslide Conveyor, enclosed type, conveys raw materials from preliminary grinding mills and delivers it, through three side-discharge valves, to bin below. Air piping from 1½ hp. fan is at far end of Airslide.



F-H Airslide, open type, installed in bottom of raw-material storage and blending bin at Giant Portland Cement Company. The 5-hp. blower in the background furnishes the necessary air.

Once again, the F-H Airslide Conveyor has proved to be the best way to move dry, pulverized material.

The Giant Portland Cement Company, Egypt, Pa., installed an Airslide system . . . and discovered, like many other companies, that it had cut handling costs. Hazards to workmen have been eliminated. Power costs are negligible. There are no breakdowns and costly repairs. Raw materials, aerated to flow like water, travel from grinding mills to bin, and from bin to elevator at rate of 90 tons an hour. Power requirements? One blower and one fan: total 6½ hp.

The side-discharge valves installed in the Airslide above the bin may be set either to direct entire material flow through one spout, or divert any portions of the material stream to obtain a desired distribution to the bin below the floor.

The Airslide Conveyor is just about tops in simplicity. There is no need for lubrication or costly down-time. There are no moving parts in the conveyor itself. An Airslide can't be equalled for flexibility in plant design.

If your conveying costs are cutting into profits, call in a Fuller representative. He'll survey your plant and submit recommendations without obligation on your part. His advice may well be your key to more efficient and profitable operation.

FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St., Chicago 3
420 Chancery Bldg., San Francisco 4

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—
COMPRESSORS AND VACUUM PUMPS—
FEEDERS AND ASSOCIATED EQUIPMENT

fuller

FH-13

readers' guide to advertised products

(Continued from page 102)

PIPE & FITTINGS

561—See page 48. Flexible Metal Hose: Troublesome connection problems where there is movement between parts, misalignment, vibration or expansion and contraction are effectively solved with CMH Flexible Metal Hose. Write for literature describing the CMH line today. Chicago Metal Hose Corp.

562—See page 125. Pipe Unions: Bronze-to-bronze ball joints insure long life and tight joints. Because of precision in manufacture these unions can be disconnected and reinstalled many times. Send for complete information today. Dart Union Company.

PUMPS

563—See page 131. New Condensed Pump Catalog: Write for your copy of the condensed Catalog "M". Aurora invites your special pump problems which will be handled efficiently by personnel devoted exclusively to pump design and manufacture. Aurora Pump Company.

564—See page 118. Difficult Pump Problems: Marlow specializes in manufacturing pumps which solved some of industry's most perplexing pumping problems. Use the coupon on page 118 for literature on these pumps. Marlow Pumps.

565—See page 37. Centrifugal Pumps: Write for latest Bulletin on Worthington Centrifugal Pumps. More than 10,000 standard combinations of capacities, heads, casings and mountings insure the right pump for you. Worthington Pump and Machinery Corp., Pump and Compressor Merchandising Div.

566—See page 97. Unipumps: For efficient, liquid handling in your plant—application, installation, replacement—consult a Weinman representative. Unipumps handle up to 1000 g.p.m., heads to 500 ft. The Weinman Pump Mfg. Co.

REFRACTORIES

567—See page 55. Refractory Products: Write for full details on B&W firebrick, castables, mortars, plastics, insulating firebrick. Let Babcock & Wilcox solve your refractory problems. Babcock & Wilcox Co., Refractories Division.

568—See page 112. Refractory Cement: Super-Moldit triples life of boiler burner blocks. They cut replacement costs in half. Moldit comes in several types of various boiler refractory parts. Write for catalog. Refractory & Insulation Corp.

SOOT BLOWERS & TUBE CLEANERS

569—See page 30. Tube Cleaners: The new Rotojet removes scale so fast it actually pays for itself in one cleaning. Models available for practically any size tubes. Send for Rotojet Bulletin. Elliott Company - Roto Division.

STEAM SPECIALTIES

570—See page 124. Thermostatic Traps: For trapping instrument sterilizers, water stills, coffee urns, warming tables and similar equipment—use Illinois. Write for free literature. Illinois Engineering Co.

571—See page 32. Hoffman Traps: Be sure to write Hoffman for full data on float and thermostatic traps, radiator traps, inverted bucket traps, dirt strainers and supply valves. Hoffman Specialties insure long term low operating cost. Hoffman Specialty Company.

572—See page 128. "Y" Strainer: Ideal for the protection of steam traps, reducing valves, temperature controls, air control equipment, pumps, etc. Sizes ¼" to 4". Write for Catalog 68-J today. Strong, Carlisle & Hammond Co.

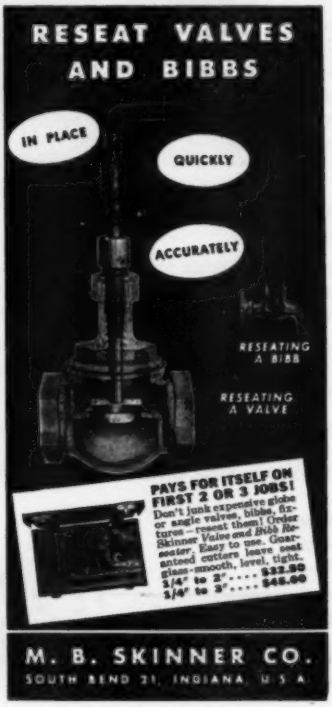
573—See pages 8, 9. Level Indicators: Yarway now offers a complete system for constant, accurate check of boiler water and other liquid levels—at the boiler drum—on the instrument panel —throughout the plant. For complete information on Yarway Indicators ask for Bulletin WG-1822. Yarnall-Waring Co.

574—See page 62. Yarway Steam Traps: Maintain even temperatures because they continually sample and respond to a trickle of the condensate. Write today for full information on Yarway Impulse Steam Traps. Yarnall-Waring Company.

575—See page 136. Steam Traps: Super-Silvertops save you money in two ways—cut down installation costs and keep operating costs low. Write for helpful book, "Solving Steam Trap Problems." The V. D. Anderson Company.

TOOLS

576—See page 113. Tube Rolling Control: You can be sure of maximum tube rolling accuracy, even with inexperienced operators, with this new, improved tube rolling control. Advertisement outlines 8 ways it's better. Write for free information. Airetool Manufacturing Company.


RESEAT VALVES AND BIBBS
IN PLACE
QUICKLY
ACCURATELY
RESEATING A BIBB
RESEATING A VALVE
PAYS FOR ITSELF ON FIRST 2 OR 3 JOBS!
Don't junk expensive globe or angle valves, bibbs, fixtures—reseat them! Order Skinner Valve and Bibb Reseater. Easy to use. Gear-mounted cutters leave seat glass-smooth, level, tight.
1/4" to 2" $32.50
1/4" to 3" $46.50
M. B. SKINNER CO.
SOUTH BEND 21, INDIANA, U.S.A.

577—See page 104. Valve and Bibb Reseater: Don't junk expensive globe and angle valves, bibbs, fixtures—reseat them with the Skinner Valve and Bibb Reseater. Easy to use. Pays for itself on first 2 or 3 jobs. Write for more information or order from M. B. Skinner Co.

578—See page 126. Controlled Tube Rolling: John Crane control simplifies expanding of condenser and heat transfer tubes to point where operating skill is no longer necessary for perfectly rolled tubes. Write for descriptive booklet. Crane Packing Company.

579—See page 127. Cut Your Own Keyways: See page 127 for coupon which will bring you complete information on "Minute Man" Keyway Broach Kit and price list. Cut any standard keyway in 60 seconds at a cost of only 1c each. The du Mont Corporation.

580—See page 133. Traction Dyanamometers: Since 1835, John Chatillon & Sons have been world famous for the precision manufacture of force measurin devices which meet the most specific requirements of industry. Fill in and mail the coupon shown on page 133 for the complete brochures you need in your plant. John Chatillon & Sons.

TURBINES

581—See page 40. Power Saving Turbines: Eight-page Bulletin S-116 illustrates and describes application, construction, savings effected and advantages of the Terry solid wheel turbine. Write for your copy now. The Terry Steam Turbine Co.

VALVES

582—See page 44. Steel Valves: If you need gate, globe, angle, or check valves this company can provide you with an unusually wide variety for almost every engineering requirement. The Chapman Valve Mfg. Co.

583—See page 117. Valves: Outstanding design, sound engineering and rugged construction are built into every Fairbanks valve to meet all kinds of valve requirements in industry. Write for details. The Fairbanks Company.

584—See page 60. Crane Valves: Dependable quality Crane valves insure low maintenance costs. Ask your Crane representative for a demonstration or write for full details. Crane Co.

585—See page 114. Butterfly Valves: Rockwell designs many valves for special applications. Write for catalog describing complete line of standard valves to 72" pipe size—manual or automatic controls. Also, ask to receive "Rockwell Valvings" monthly. W. S. Rockwell Company.

586—See page 105. Diaphragm Valves: Hills-McCanna offers over 20,000 different assemblies for valving "hard-to-handle" fluids—32 bonnets—14 diaphragm materials—49 body materials. Write today for full information and descriptive literature. Hills-McCanna Co.

587—See page 108. Williams-Hager Check Valves: Available for every service in standard pipe sizes from 1" to 20". Avoid costly water hammer troubles. Write today for Bulletin WH-100. The Williams Gauge Co.

WATER TREATMENT

588—See page 119. Water Treatment: Write for detailed information about solving your water treatment problems. This complete service includes each step from original survey of problem to installation of water purification equipment. General Filter Co.

589—See page 11. Water Treatment System: Write today for complete information on the Nalco System of Water Treatment and how it can reduce your costs and increase effectiveness of water treatment in your plant. National Aluminate Corp.

590—See page 53. Cuno Flo-Klean Filter: Makes raw water suitable for many plant services, keeps recirculated water clean, pays for itself in quick time. Write today or send coupon for full information. Cuno Engineering Corporation.

591—See page 59. Drew Water Treatment Service: Starts with the conditions that exist in your plant and includes all the corrective and preventive measures required for efficient operation. If you would like to cut costs, consult the Drew Engineer or write for information. E. F. Drew & Co., Inc.

592—See page 124. Versene Test Kit: Lets you test the hardness of water in your plant in less than two minutes. Includes enough chemical to make more than 50 separate tests. Refills available. Full directions in each kit. Write today. Bersworth Chemical Company.

593—See page 92. Elgin Ultra Deionizer: A truly revolutionary development for perfect boiler feedwater at an overall cost comparable with ordinary water conditioning systems. Write today for detailed information. Also note on page 92 Bulletins available on other products. Elgin Softener Corporation.

594—See page 46. Deaerating Heater: Graver heaters are doubly guaranteed to deliver water preheated to full steam temperature, and to reduce oxygen to less than 0.005 ml/liter. Write today for complete information. Graver has right heater for your power plant needs. Graver Water Conditioning Co.

595—See page 38. Concentrol: Concentrol stops foaming by effecting a rapid change in surface tension of steam bubbles which permit coalescence of small steam bubbles into bubbles of larger size. This eliminates foam build-up and subsequent carryover. Free Data Sheet available. The Bird-Archer Company.

596—See page 23. Formula 134: This formula works rapidly and completely without damage to metal surfaces to remove scale wherever it forms in your heat exchange system. All the important details and information concerning this formula are ready for you in handy Bulletin form. Ask for Bulletin 5002 today. Dearborn Chemical Company.

597—See page 127. Water Treating Equipment: Get your copy of fact-filled bulletins giving complete data on manual or automatic equipment in all sizes, types and capacities. Hungerford & Terry, Inc.

598—See page 6. Boiler Water Comparators: Low cost, extreme accuracy, simple operation make Taylor Comparators ideal instruments for all plants. Write for free booklet. W. A. Taylor and Co.

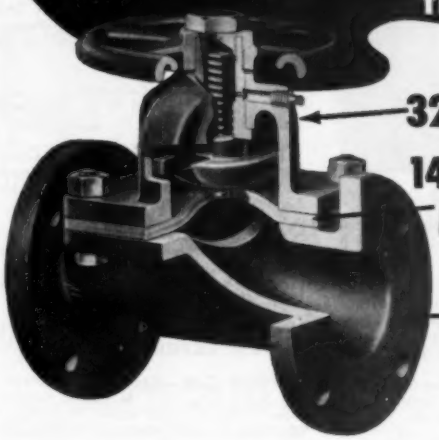
MISCELLANEOUS

599—See page 128. Powdered Rosin: A better product because it is produced with proper equipment, carefully supervised during milling processes, laboratory tested to assure proper color and quality. Additional details and prices on request. S. P. Penick & Company.

Hills-McCanna offers

Over 20,000

different assemblies for valving "hard-to-handle" fluids



32 Bonnets

14 Diaphram Materials

49 Body Materials

All the various possible combinations of bonnet assemblies, diaphragms and body materials available in Hills-McCanna valves total over 20,000! True, many of the combinations would not be practical, but this figure does indicate the tremendously wide variety of valves that Hills-McCanna offers. No matter how specialized your problem of valving corrosive and/or hazardous substances, slurries, viscous liquids, gases, fermentation products, materials subject to coagulation, foods or beverages, the chances are that Hills-McCanna can furnish the proper valve to meet your needs.

Hills-McCanna valves are Saunders patent diaphragm valves wherein the closure is affected by pressing a resilient diaphragm against a transverse weir. Working parts are isolated from the flow. The valve is leak-tight and requires no packing. Sizes from 3/8" to 14".

Write, today, for full information and descriptive literature, HILLS-McCANNA CO., 3355 W. Nelson St., Chicago 18, Ill.

HILLS-McCANNA

Saunders patent diaphragm valves

Proportioning Pumps

Force-Feed Lubricators • Magnesium Alloy Castings

NEWS . . . of men and companies

AWARDS

W. H. Armacost

Combustion Engineering-Superheater, Inc.—Wilbur H. Armacost, v-p of engineering, received the Stevens Honor Award Medallion at the 81st Annual Alumni Dinner of Stevens Institute of Technology for his contributions to the solution of design and materials problems involved in the use of high steam temperatures and pressures.

Goodyear Tire & Rubber Co.—The Tubes and Accessories Division received the C. Slusser Memorial Trophy for a record 1,350,000 man-hours without lost-time accident. Second place went to the Pathfinder Chemical Corp.

SALES OFFICES

H. K. Porter Co., Inc.—The 14 supply stores of International Derrick and Equipment Co. have been purchased. The stores will be operated as the Jarecki International Supply Div. and will continue to sell and service products of International Derrick.

Allis-Chalmers Mfg. Co. — Branch office of the general machinery div. is opened in Peoria, Ill. S. E. Bovim is named manager.

American Chain & Cable Co., Inc.—Atlanta offices are now located in a new office and warehouse building at 1401 Howell Mill Road, N. W.

Arcos Corp.—West coast office and warehouse in Los Angeles is now open at 427 S. Western Ave. for its line of alloy welding electrodes.

Hercules Powder Co.—San Francisco office has been moved to the Standard Oil Bldg., 225 Brush St.

Patterson Foundry & Machine Co.—New York district offices are in new and enlarged quarters, Suite 5115, Empire State Bldg.

Swartwout Co.—New office at 836 Michigan Theatre Bldg., Detroit, will service southeastern Michigan. Director of power plant equipment sales is K. P. Hengesbach.

NEW REPRESENTATIVES

Hilliard Corp.—The Betz Engineering Sales Co., 1225 Magazine Street, New Orleans, will cover Louisiana, Mississippi, and southern Arkansas.

Marcus Transformer Co. — W. D. Evan Jr., Pacific Industries, 1046 S. Olive St., Los Angeles 15, succeeds Robert Young & Co.

Reliance Gauge Column Co.—Charles P. Crowley, 711 Gibbons St., Los Angeles, is made sales engineer in the southern California area.

MANUFACTURING COORDINATED WITH CUSTOMERS' PROJECTS

A new plan of customer service, designed to minimize present day scheduling difficulties, is announced by Combustion Engineering-Superheater, Inc. One salesman in each territory will spend full time in liason between the customer and the purchasing, contract and production departments in New York. A manager there will act as production coordinator and will supervise the special field squad.

The field man in contact with the customer relays promptly to New York any changes in the projects which might affect scheduling, production or shipping of equipment. He will also advise the customer of any delay caused by circumstances the customer might be able to rectify.

Execution of contracts will thereby be coordinated with the development of the project as a whole. The field man will also act as company expediter for supplies purchased in his district.

Ward Leonard Electric Co.—Maury E. Bettis Co. is industrial and electronic sales representative in the Kansas City area.

EXPANSIONS

Carboloy Co., Inc. — Approximately $800,000 is being devoted to expanding present plants on 8-Mile Road, Detroit, while $2,000,000 is to be spent for construction of a new plant in Edmore, Mich.

Caterpillar Tractor Co.—Erection of a new die and fixture building, 262 by 404 ft with approximately 106,000 sq ft of floor space, is planned.

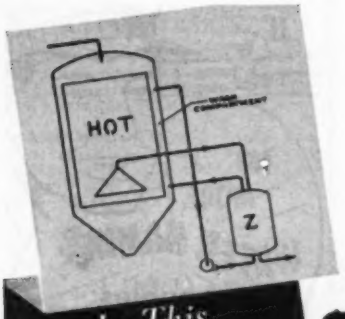
E. I. duPont de Nemours & Co. — First production unit for a new process for hydrogen peroxide will be built at Memphis, where the company is just starting to build a unit for the production of sodium cyanide. Also announced

(Continued on page 108)

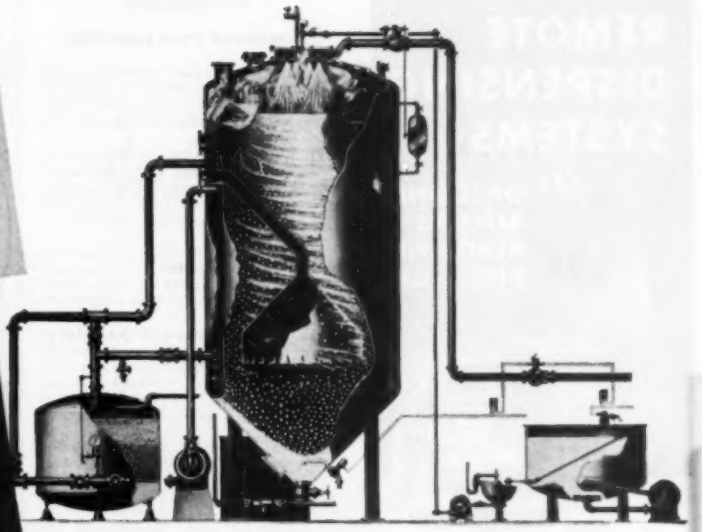
Front, left to right—J. J. MacDonald, J. R. Clemens, D. J. Godschall, R. F. McCaw, J. M. Waligora. Rear; D. R. Long, C. E. Stiner, D. P. West, and W. H. Redding

Greater Philadelphia Plant Engineers' Club—Formally organized by a group of plant engineers who have been meeting the last few months to discuss plant engineering problems, the club has elected the following officers: David J. Godschall, Heinz Manufacturing Co., president; James R. Clemens, Link-Belt Co., vice-president; John M. Waligora, Sharp & Dohme, Inc., secretary-treasurer; and Robert F. McCaw, RCA-Victor Div., and James J. MacDonald, General Electric Co., board members.

Charter members also participating were: R. R. Frederick, Sloane-Blabon Corp.; Bert Levers, Yale & Towne Mfg. Co.; D. R. Long, Crown Can Co.; W. H. Redding, Rohm & Haas Co.; C. E. Stiner, Rohm & Haas Co.; and D. P. West, Simmonds Abrasive Co. The new group meets monthly at the Poor Richard Club for discussion and interchange of experience on problems relating to the common interests of the plant engineering group.



In This
WORTHINGTON
HOT-Z
Deaerating Type Water Conditioning System . . .



Built-In Annular Wash Water Compartment Supplies and Reclaims Backwash Water

Independent of the Softening Process

No other Hot Zeolite System offers you so many advantages as this Worthington Hot-Z System. A quick review of the vital facts will show you why.

As you probably know, Hot Zeolite beds require periodic expansion to minimize packing and friction loss, and to insure efficient contact of each Zeolite particle with its share of dissolved impurities. This need for bed expansion occurs not only during the regeneration routine, but also several times during the period between regeneration routines. That's why it is important for you to use clean, softened water, preferably at normal operating temperature, for the reverse flow or "backwash" operation.

Worthington does it!

The Worthington Standard Hot-Z System with its backwash feature provides a built-in annular wash water compartment that supplies and reclaims backwash water . . independent of the system's softening process. In this compartment, backwash water is cleaned and maintained at normal operating temperature.

This backwash feature pays off particularly in systems employing filters because it *makes filter beds last as long as eight years.*

Other advantages

Worthington Hot Process Systems come equipped with modern, direct contact vent condensers. This means, no more of the scaling trouble that made the old-fashioned shell and tube types such a nuisance.

In addition, Worthington Hot-Z Systems operate on low-priced lime and salt. That's why the average installation saves enough in chemical costs to pay for itself in 3 years.

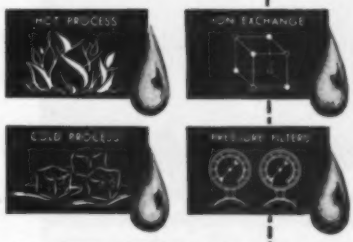
Get all the facts!

It will pay you to investigate the Worthington Hot-Z System thoroughly. Tell us your conditions of service and get our recommendation in terms of dollars and benefits. You'll find in our Hot-Z System, as in so much other equipment, *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Water Treating Section, Dunellen, N. J.*

WORTHINGTON

WATER CONDITIONING

Worthington Makes More of the Equipment for All Types of Water Conditioning Systems



REMOTE DISPENSING SYSTEMS

for GASOLINE
BENZINE
KEROSENE
DIESEL OIL

These ruggedly built dispensing systems are designed for accurately measured deliveries of such non-corrosive liquids as gasoline, benzine, kerosene, diesel oil, etc., at rates up to 25 gallons per minute.

Each unit consists of a dispensing pit for flush installation in ground or floor (shown above) and a separate pumping unit in a sheet metal housing (shown below).

Pit is constructed of heavy steel plate with hinged cover. This unit contains 50 feet of 1" hose with nozzle on a circular hanger, four-piston positive displacement meter with 10,000 gallon roller type register and totalizer, static discharge wire and reel, strainer, and power and light switches.

Pumping unit, for remote installation, is two-stage centrifugal type for 110 volt, 60 cycle, single phase current. Includes water and air separators and pressure regulating valve.

Complete information on the adaptability of these systems for special applications, and descriptive bulletin, will be mailed immediately upon request.

Products of one of the world's largest makers of gasoline pumps, these remote dispensing systems are built for long years of service under severe operating conditions. *Available for quick shipment.* Price $275.00 net, f.o.b. West Springfield.

GILBERT & BARKER
MANUFACTURING COMPANY
West Springfield, Massachusetts

EXPANSIONS

(Continued from page 106)

are plans for a major expansion of the Repauno plant at Gibbstown, N. J., and construction of a commercial explosives plant near Martinsburg, W. Va.

H. K. Ferguson Co.—A plant of the Diamond Magnesium Corp. at Painesville, O., will be rehabilitated under a government contract to produce magnesium by the electrolytic process.

Hercules Powder Co. — Completion of a three-story addition to the main laboratory building at its Experiment Station near Wilmington is announced.

Minneapolis-Honeywell Regulator Co. — Engineering personnel and departmental facilities of the Valve Div. at Philadelphia is expanded 400 per cent for research and development of new industrial valve designs.

Mutual Chemical Co.—Completion of a plant which will increase production of essential chromium compounds is announced. Located on Baltimore harbor, it is the largest and most modern chromium chemical plant in the world.

National Tube Co.—A large extrusion plant to manufacture high alloy seamless specialty tubes, shapes and bars will be installed at Gary.

Petro-Chem Development Co.—Contract on a refinery designed by Hydrocarbon Research, Inc., for the National Petroleum Council of Brazil, Cubatao, Brazil, calls for ten furnaces to charge an oil refinery of 45,000 barrels per day capacity.

Republic Steel Corp.—Plans for construction of a seamless tube mill at the South Chicago Works were announced. First facility for tubular products by Republic in the Chicago district, it will produce in excess of 150,000 tons per year. Other expansions are at Birmingham and Cleveland.

Joseph T. Ryerson & Son, Inc.—Expansion program at the St. Louis plant includes reconstruction and new layout of the present plant, and construction of warehouse space totaling approximately 50,000 sq ft.

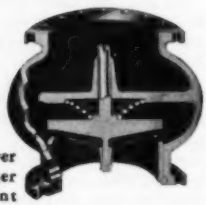
Sylvania Electric Products Inc. — Option obtained to purchase the Continental Can Co. building in Wheeling, W. Va., for manufacture of fluorescent lighting fixtures. Operations begin April 1 in the two-story building with 100,000 sq ft of space.

Trion, Inc.—An expansion program for the manufacture of electric air filtering equipment is announced.

Westinghouse Electric Corp.—Purchase of a 70-acre tract in western Alabama for a new light-bulb plant was announced. One mile south of Reform, and 29 miles east of Columbus, Miss., the one-story plant will have 150,000 sq ft of floor space.

Headquarters plant and engineering laboratories of the new Electronic Tube Div. will be on a 100 acre tract 4 miles from Elmira, N. Y. It will provide 1000 new jobs, mostly filled from Elmira.

WILLIAMS-HAGER
flanged
Silent check
VALVES



Wherever Williams-Hager flanged Silent Check Valves are installed, plant maintenance men will tell you their costly water hammer troubles are over. These dependable, durable and compact valves can be placed in your water system in any position, including angular, and will provide maximum protection at all times. They are available for every service in standard pipe sizes from 1" to 20". Why not rid your plant of water hammer *now* . . . get Williams-Hager Check Valves.

Write today for Bulletin WH-100.

CHECK VALVES

THE WILLIAMS GAUGE CO.

Pump Valves . . . Water Gauges . . . Gauge Cocks . . . Steam Traps . . . Pump Governors . . . Feed Water Regulators . . . Water Columns

3100 PENNSYLVANIA AVE. • PITTSBURGH 33, PA.

APPOINTMENTS

Alloy Steel Products Co.—Harold J. Bartlett is appointed sales manager, with headquarters in Linden, N. J. He was manager of Crane Co.'s alloy sales.

Allis-Chalmers Mfg. Co.—A. W. Van Hercke has been named v-p in charge of Tractor Div. Engineering. G. E. Smart is made assistant plant engineer at the Norwood, O. Works.

American Hoist & Derrick Co.—R. J. Stoddard was elected v-p of engineering and J. E. Carroll, general sales manager, was made v-p of sales.

The Babcock & Wilcox Tube Co.—D. W. Jones, Jr. was appointed sales agent in the Rocky Mountain area. Alan W. Abegglen to sales force of the Beaver Falls, Pa. office.

Borg-Warner Corp.—M. A. Straub was made sales manager of the Norge Heat Division.

Builders-Providence, Inc.—J. R. Hartley, well-known in water, sewage and industrial waste treatment fields, was elected vice-president.

Combustion Engineering-Superheater, Inc.—G. J. Nicastro, sales engineer, was elected v-p in charge of the northeastern region by the National Society of Professional Engineers.

G. J. Nicastro

J. S. Smith

Wagner Electric Corp.—J. S. Smith is appointed director of purchases. He joined the company in the research department in 1919.

Cochrane Corp.—S. B. Applebaum was made manager of the water treatment div. He was founder and is v-p of Liquid Conditioning Corp., now a subsidiary.

Cooper-Bessemer Corp.—Grant C. Woodard is appointed to the field sales and engineering staff in Michigan, Ohio, West Virginia, Kentcky and Tennessee.

Dearborn Chemical Co.—C. S. White is appointed head of water treatment dept. replacing S. H. Opdyke, retired. H. E. Johnston becomes manager of NO-OX-ID sales, replacing C. A. Remsen, deceased.

De Laval Steam Turbine Co.—P. J. Patton appointed Milwaukee manager for the Commercial Sales Div. with headquarters at 1932 N. 117th St., Wauwatosa, Wis.

Dravo Corp.—G. O. Griffin, director of safety, is named insurance manager, replacing Robert Hughes, appointed executive assistant to general manager

THERE'S

No Reducing Problem

when you use

Masoneilan

Reducing Valves

Masoneilan Pressure Regulators —for steam, water or air service —reduce waste, cut costs and save money by holding pressures within the required limits without constant maintenance. That's why you find plant men in all types of industry using and recommending them for reducing service. Their experience proves that Masoneilan valves eliminate pressure reducing problems.

No. 11 for steam service — Sizes ½" to 4". Reduced pressure ranges between 5 and 75 psi or 75 and 225 psi. Maximum working pressure 250 psi.

No. 227 for water service—Sizes ¼" to 2". Reduced pressure range between 10 and 60 psi. Maximum working pressure 150 psi. Also available for air service from ¼" to 1".

Your local Mason-Neilan industrial distributor is ready to serve you from stock; or write

MASONEILAN

Mason-Neilan Regulator Company

1191 ADAMS STREET, BOSTON 24, MASS.

Sales Offices or Distributors in the Following Cities: New York • Syracuse • Chicago • St. Louis Philadelphia • Houston • Denver • Pittsburgh • Cleveland • Cincinnati • Tulsa • Atlanta Detroit • Los Angeles • San Francisco • Salt Lake City • El Paso • Boise • Albuquerque Charlotte, N.C. Mason-Neilan Regulator Company, Ltd., Montreal and Toronto

of the Engineering Works Div. M. L. Hicks is manager of Philadelphia district office.

Eriez Manufacturing Co.—O. F. Merwin was elected chairman and is succeeded by R. F. Merwin as president and general manager.

Enterprise Engine & Machinery Co.—H. D. Bahr is appointed manager of service department. During the war he supervised rehabilitation of captured power plants and construction of new diesel plants.

Fairbanks, Morse & Co.—T. E. Woodruff was appointed manager of Pump Div. with headquarters in Chicago, succeeding D. T. Johnstone, made pump department manager of San Francisco branch.

Goodyear Tire and Rubber Co.—Films and Flooring Div. apoints W. F. Diffenderfer to handle Vinylfilm sales, and G. L. Sutton as flooring representative in Chicago. Other assignments are: Gordon Cummins, to Chicago; K. W. Dvorak to Texas City; E. T. Long to St. Louis; R. A. Weiner to Houston; W. P. McCourt to Chicago and F. C. Marsh to Omaha.

A. E. Whitney, Jr. is a special representative of the Chemical Div. with headquarters in New York.

General Electric Co.—F. K. McCune has been appointed manager of engineering of large apparatus div., Schenectady.

V. R. Childress is appointed manager of sales analysis and planning for the Chemicals Div.; J. C. Mogavero to facilities engineer of manufacturing div.; and E. F. Arnett is placed in charge of the Pittsfield chemical process development section in the chemical dept.

Hercules Powder Co.—E. S. Ladley is ass't director of purchases succeeding W. L. Hewes, retired after 41 years service.

International Nickel Co. of Canada, Ltd.—Dr. John F. Thompson, president, succeeds the late Robert C. Stanley as chairman of the board. He joined the company in 1906 to design and operate a research laboratory for monel. Dr. Paul B. Merica, executive v-p and director, was elected to the executive and advisory committees.

Johns-Manville Corp.—L. M. Cassidy was elected chairman and chief executive officer succeeding Lewis H. Brown, deceased. Adrain R. Fisher was appointed president, W. R. Wilkinson, v-p for sales and K. W. Huffine, v-p for production.

National Electric Products Corp.—T. M. Linton is appointed district manager of Washington, D. C. territory.

Rockwell Manufacturing Co.—Munro Corbin is elected controller and I. C. Rowe secretary. Paul A. Wick was made assistant to the president.

Southern Coal Co.—Ted L. Kelce was elected executive v-p. For 15 yr, Kelce interests have been identified with the company which served them as sales agents for their mines. Kelce brothers acquired control in 1950.

Westinghouse Electric Corp.—Matthew Westphal is made manager of lamp plants at Bloomfield and Trenton, N. J.; W. J. Williams, manager of parts plants in Bloomfield and Belleville, N. J., and at Paris, Tex., where ground has just been broken; E. W. Noxon, manager of lamp plants at Richmond, Ky., Bowling Green, Ky., and Little Rock, Ark. J. E. Woodall has been named regional manager at Fairmont, W. Va.

C. W. Beauchamp

H. M. Bowman

Link-Belt Co.—C. W. Beauchamp is appointed ass't. sales manager, Ewart plant, for both silent and roller chain; and H. M. Bowman is ass't. sales manager, Ewart plant, for general products. Thomas Cornils to chief engineer for Pacific Northwestern Div. with headquarters at the Seattle plant.

Worthington Pump and Machinery Corp.—W. F. Weinreich will be in charge of the corporation's newly acquired Oil City (Pa.) plant. A. W. Fraser is appointed midwest sales manager, headquarters in Chicago.

CORRECTIONS

The Okonite Co.—The name of E. D. Youmans, who was appointed v-p in charge of manufacturing, was misspelled in the March issue.

Yarnall-Waring Co.—Item on page 124 of the March issue should have read: D. Robert Yarnall, president, was awarded honorary membership in the Engineers' Club of Philadelphia.

OBITUARIES

Johns-Manville Corp.—Lewis H. Brown, who for 22 yrs was chief executive officer, died February 26 at the age of 57. He became president 2 yrs after joining the company in 1927 and is credited with much of its success.

Golden-Anderson Valve Specialty Co.—J. A. Voland, president, died Mar. 10.

Norton Co.—Russell L. Peck, refractories engineer, was killed in an automobile accident. Prior to 1945, he had been a refractories engineer for several concerns in the east.

Petro-Chem Development Co.—Arthur H. Sherwood, eastern district sales manager died at the age of 70. He was a pioneer oil equipment man and has been with Wilson-Snyder Pump Corp. and C. S. Steel Corp.

MEETINGS and EXHIBITIONS

Highlights of coming meetings that will aid executives and engineers in planning itineraries. For additional information, please write sponsors of meetings

APRIL

Baltimore Welding Show—A three-day welding clinic featuring demonstrations of welding techniques by the country's top technicians will be held on April 18, 19 and 20 at the Baltimore warehouse of Whitehead Metal Products Co., Inc. Admission is open to metal users, their representatives and employees, engineers and engineering students.

Materials Handling Exposition will feature new developments in outdoor materials handling at the International Amphitheatre, Chicago, April 30-May 4. Clapp and Poliack, Inc., 341 Madison Ave., New York 17, N. Y.

The British Industries Fair will be held April 30 through May 11. Heavy industry will be centered in Birmingham (England) and other trades will be on display in London. British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

MAY

Third World Petroleum Congress will be held at The Hague-Scheveningen (Holland) from May 28 to June 6, 1951. For more information or copies of papers, write Office of Secretary, USA National Committee, K. G. Mackenzie, 135 East 42nd St., c/o The Texas Co., New York 17, N. Y.

American Institute of Electrical Engineers announce district meetings preceding the Summer General Meetings, Toronto, Canada, June 25-29.

Syracuse is the scene of the Northwestern District meeting, May 2 to 4.

The Great Lakes District meeting will be held from May 17 to 19 in Madison, Wisconsin.

Society for Experimental Stress Analysis, will hold its spring meeting at the National Bureau of Standards and the Wardman Park Hotel in Washington, D. C., on May 16, 17 and 18. All inquiries should be addressed to Dr. Edward Wenk, Jr., c/o The David Taylor Model Basin, Washington 7, D. C.

Engineering Industries Exposition, sponsored by New York State Society of Professional Engineers will be held at the Hotel Statler in New York, May 10, 11 and 12. Write NYSSPE, 1941 Grand Central Terminal, New York.

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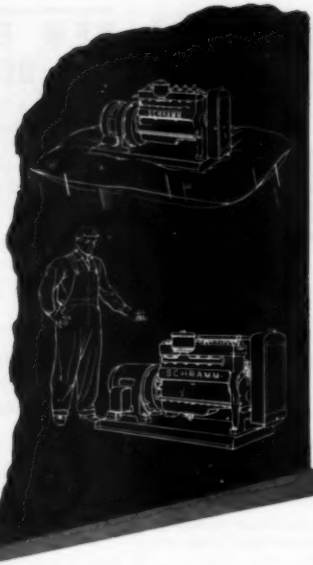
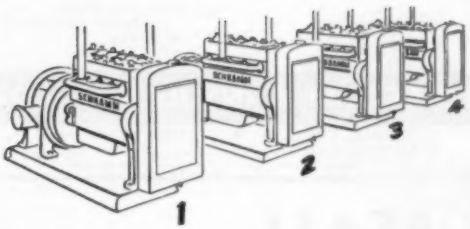


SCHRAMM
"UNIT SYSTEM"



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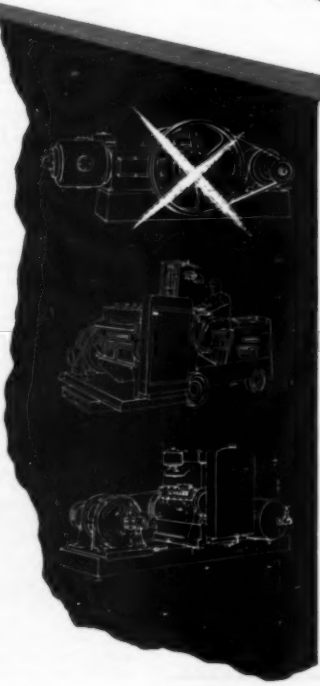

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With ease, and without elaborate foundations (two savings in installation alone) you can install several Schramm Air Compressors . . . as your air needs require . . . in a minimum of space . . . for less money than one large compressor. This set-up offers such advantages as:

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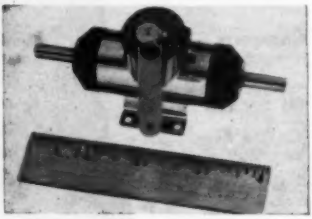
The Albany Line is the result of almost a Century of skillful refining of the right lubricants to meet widely divergent needs. There is a correct oil or grease for every purpose. Ask your Mill Supply house to show you the Albany chart of Specifications. They can supply you with the right Albany Lubricants.

ADAM COOK'S SONS Inc.
Linden New Jersey

NEW EQUIPMENT AND DEVELOPMENTS

(Continued from page 22)

compact, sealed unit has ratings up to 2 lb-in. of torque, 0.025 hp, 20,000 rpm, and the ratio is infinitely variable from 1/6 to 6. It is advantageous in applications requiring remote or automatic control. By applying linkages, or cams, a wide variety of control techniques is possible. The actuating lever carries a pointer, which indicates ratio setting on top of the unit. However, remote



ratio indication can easily be obtained by means of a scale associated with the remote actuating speed adjuster. Speed is adjusted by changing the radius at which rollers make contact with discs. Applications include timers, recorders, controllers, indicating mechanisms and similar low-power devices. The unit is quite suitable where severe ambient conditions are encountered.

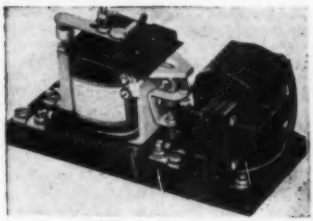
For more information use one of the convenient reply cards on page 101. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

24—MAGNETIC ELEMENT COMES IN THREE STYLES

Permanent conveyer element, available in three styles for conveying skelp, plate, sheet, rod, bar, pipe and shapes has been developed by the Eriez Mfg. Co. Because a standard iron-pipe length or other standard section can be used as the revolving induced-magnetic unit, the conveyer elements are simple to repair, resurface or replace. In use, a maximum amount of conveyed magnetic material is subjected to the direct action of the magnetic field, since the major magnetic field is at right angles to the material movement and extends for the full width of the conveyer. Magnetic force is not limited by the diameter of the magnetic rotating member since the element is a separate unit and can be varied in size and strength as required. Strength of the unit can also be adjusted simply by changing the air gap between the plate magnet and revolving members suspended above. Power source or magnetic element can be swung down and away from the magnetically induced members, eliminating the attractive force for easy cleaning or for non-magnetic operation.

25—RELAYS GIVE LOW VOLTAGE PROTECTION

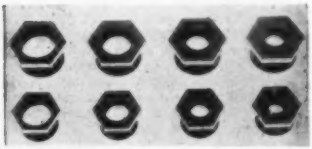
Ward Leonard Electric Co. announces the addition to their standard line of magnetic relays for industrial and commercial control applications. These units are intended for use in alternating current circuits



where a close voltage differential between relay pick-up and drop-out is needed. Because the reactor imparts non-linear characteristics to the relay circuit, slight voltage changes across the series combination result in wide current variations required for close differential operation. Unlike ordinary voltage sensitive relays, these are chatter-free and capable of switching relatively large amounts of power. Nominal coil voltages for standard heavy-duty types are 115, 230 and 440-v 60 cycles; for light-duty types, 115 and 230-v. Relays with 115-v coils pick-up at 105v and drop-out at 95v. Heavy-duty contacts are rated at 25 amp, 230-v, 60 cycles, 2 hp maximum.

25A—PLASTIC PIPE FITTINGS AVAILABLE

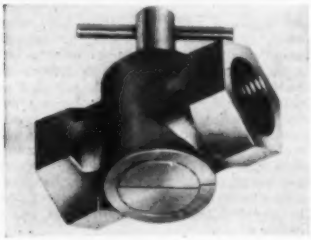
The Carlon Products Corp. has announced the development and production of a new line of injection-molded plastic reducing bushings and end plugs for use with Car-



lon plastic pipe. The units feature a hexagonal ring for positive wrench grip to facilitate installation, and they utilize International Pipe Threads. Reducing bushings are available in fifteen different sizes, and pipe plugs are obtainable in six sizes. Because of the wide range of sizes available, only one reducer bushing is required to reduce any pipe diameter to any other standard size. Molded from a single piece of thermoplastic material, the new fittings bring all of the inherent advantages of plastics to the field of fluid and vapor transmission. They are extremely light in weight, can be installed rapidly and easily, and assure leak-proof connections. Molded of pure plastics, these new fittings will not contaminate fluid, vapor or gas.

26—STOP COCK EASY TO OPERATE

The Reynolds Shaffer Co. announces a stop cock for use where an exact setting of



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AHEAD OF SCHEDULE
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Even your least experienced operator can finish rolling a tough tube bundle way ahead of schedule. Industrial plants now using this new AIRETOOL tube rolling control save valuable hours every time it is put in service.
It's simple to operate. Just insert the ball bearing type expander in the tube to be rolled and when it is perfectly expanded the control automatically shuts off the motor. Expansion guesswork has been eliminated.
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Save additional time with this control. Necessary equipment can be carried on its truck and pushed from job to job in much less time.
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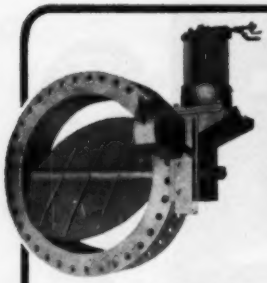

42" butterfly valve with oil-operated cylinder and counterweight for 200° F service.

ROCKWELL AUTOMATIC BUTTERFLY VALVES

Provide Automatic Flow Control and Quick Shut-Off of Air, Gases, Steam, Liquids, Semi-Solids.

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We also manufacture manually controlled butterfly valves and slide valves in all sizes, metals and types for pressures to 100 p.s.i.

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30" butterfly valve for 60 p.s.i. pressure, with Limitorque motor control and auxiliary handwheel, position indicating lights and push button.

W. S. ROCKWELL CO.

230 Eliot St. Fairfield, Conn.

Durametallic Packing Wins Test Sealing 18 Solvents and Diluents

One of the nation's leading valve manufacturers recently conducted a thorough test on the corrosion resistant qualities of three leading brands of packing.

18 solvents and diluents were used in the test as follows: Butyl Acetate, Butyl Cellosolve, Cellosolve, Ethyl Acetate, Bensol Naphtha Med. Boil., Naphtha High Boil., Solvesso No. 2, Toluene, Xylol, Amyl Alcohol, Butyl Alcohol, Ethyl Alcohol, Isopropyl Alcohol, Methanol, Acetone, Methyl Ethyl Ketone and Methyl Isobutyl Ketone.

The packing that proved successful on this 90-day test, (having no leak or corrosion affecting operation), is indicated by the test engineer's report: "A valve suitable for handling solvents, diluents, paint and lacquer thinner should have the following stem packing — DURAMETALLIC NO. 777 NMT."

We will be glad to forward information on this or other types of Durametallic Packings for valve and pump requirements . . . simply write to the Durametallic Corporation, Kalamazoo, Michigan, for Bulletin No. IP-428.

the regulated flow of water or other liquids is required. It can be used as a flow-regulating valve for jet pumps and spray pumps, as a by-pass valve on boiler feed lines, or any place where a quick-opening easy-operating flow-regulating valve or stop cock is needed. Special features include: (1) fingertip operation, (2) one-quarter turn opens or closes, (3) all-brass construction, (4) positive "O Ring" packing will withstand almost any pressure, (5) can be assembled or disassembled in 30 sec.

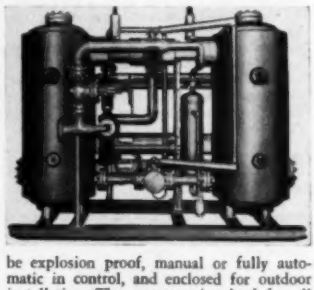
27—MINIATURE MOTOR WEIGHS 2½ OZ.

Servo-Tek Products Co. recently begun production of a line of miniature permanent-magnet field-type d-c motors. These units are 1-⅜ in. in diameter by 1-½ in. long and weigh approximately 2-½ oz. Motor voltage ratings from 6 to 28-v are available for varied service applications

ranging from fan or blower uses to telemetering sequence switch drives. Front flange or base mounting types are available. These motors employ many features not formerly available in precision miniature motors of this general type. A cylindrical, or ring type, Alnico V field magnet is used in conjunction with a 14 commutator segment armature. Long brush life and excellent commutation characteristics are achieved. All units employ precision ball bearings and are available with high altitude brushes for aircraft and allied services.

28—LIQUID DRYERS ADSORB MOISTURE

J. F. Pritchard & Co. has just announced five types of dryers that were designed specifically for fluids to 40 F. The units may



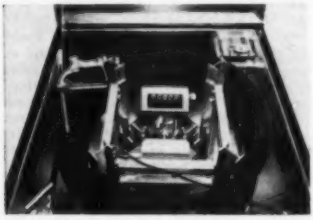
be explosion proof, manual or fully automatic in control, and enclosed for outdoor installation. The processes involved for all types are basically the same. A definite effective volume of adsorbent is provided to dry the fluid stream to a desired dew point for a specified length of time. Water is adsorbed during the drying cycle until the adsorbent approaches the saturation point. Reactivation is then necessary to vaporize and purge the adsorbed moisture. Reactivation consists of heating the adsorbent bed to elevated temperatures, followed by a period of cooling.

29—COAL-TAR COATINGS PREVENTS CORROSION

Continental Coatings Corp. has announced six coal-tar base anti-corrosive coatings for the protection of metals, wood, masonry and insulation; it has been field tested for the past twelve years under severe corrosive conditions. The coatings form a tough, elastic film, which resists the penetration of chemicals, fumes, moisture and heat. They are non-soluble in oil and are completely waterproof. All have been tested and proved in a variety of industrial uses. They resist strong inorganic acids and strong alkali, ranging from sulphuric acid to caustic potash. They also protect against alcohol, formaldehyde salt spray, a wide variety of organic acids and other chemicals. Since other costly wear conditions are often present along with corrosive influences, three of the coatings have been formulated to meet corrosive conditions in combination with various abrasive actions, heavy vibrations, extreme contractions and expansions. No primer is needed, and protection is in direct ratio to film thickness and number of coats applied.

30—PUMPING PIT DESIGNED FOR AIRPORTS

Gilbert & Barker Mfg. Co. now has a fueling station that has been designed to meet the need of small public and private airports and industrial plants for safe, efficient, modern fueling equipment. Each pit is comprised of two units—the pit proper and a pumping unit. The pit, constructed of heavy gage steel plate with welded seams, is



installed beneath the surface of the field with its hinged cover flush with the ground. This unit contains the hose and nozzle, meter and register, static discharge wire and reel, strainer and power and light switches. The pumping unit, which is installed at any convenient point remote from the pit, is comprised of the pump and motor assembly, air separator mechanism, pressure regulating valve and vent outlet. This assembly, mounted on heavy angle-iron supports, is protected by a rectangular sheet steel housing. Combining the best features of experts, it is built to withstand the hardest service.

For more information use one of the convenient reply cards on page 101. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

31—PRESSURE CELLS ARE INTERCHANGEABLE

Differential pressure cells based on SR-4 resistance wire strain gage measurement have been added to the Baldwin-Lima-Hamilton Corp. line of standard products. These cells, identified as Type FMB, are interchangeable, precision products having high accuracy, with full compensation for temperature and linear acceleration. Two pressure ranges are available: ±10 and

Doing the Impossible in a Jiffy WITH SPENCER HARTFORD VACUUM

When you pick a ton of babbitt a day out of engine heads, or remove specks from the bottom of a foundry mold, or eliminate welding fumes at their source with industrial vacuum, you are doing things that cannot be done by other methods.

That is one reason why more than 100 applications of Spencer Vacuum were accepted as essential during the last World War. And with the same machine you get plant sanitation as an extra dividend at no extra cost. That is why you should ask for the Spencer Bulletin No. 144 describing more than 100 essential and unusual applications.

427-C

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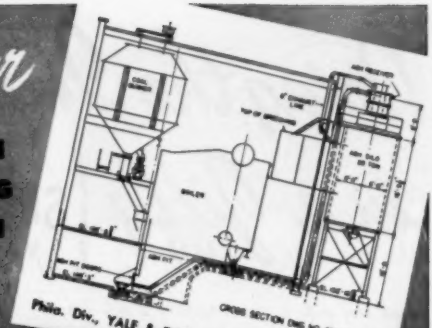
SPENCER HARTFORD

Another
COAL and ASH HANDLING INSTALLATION by BEAUMONT



Here's one of the many efficient coal and ash handling installations—designed, manufactured, installed by Beaumont. The above system is operating at the Philadelphia plant of Yale & Towne Manufacturing Company. This plant saved both time and expense—through one-contract-economy . . . But you're right! It's up to us to convince you of the advantages in a Beaumont installation: So let us send you our folder of typical installations. Write to:

Beaumont BIRCH COMPANY
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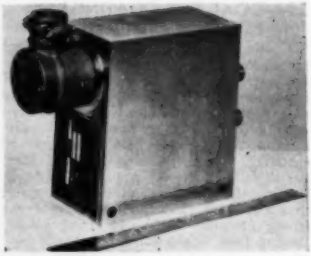
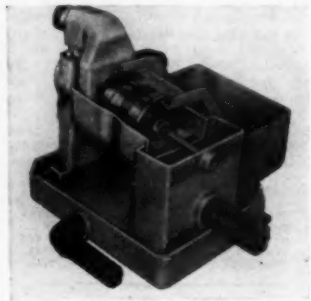


±20 psi. Maximum permissable line pressures are 50 and 100 psi, respectively. The differential pressure cell consists of a pair of matched Monel metal pressure bellows arranged to apply opposing forces on a cantilever beam to which SR-4 strain gages are bonded. The sensing element is hermetically sealed by solder in an aluminum box. Electrical connections are made through glass-to-metal seals. The cell is insensitive to linear acceleration in any direction and may be mounted in any position without affecting pressure indications. Differential cells are designed for the standard 120-ohm circuit and for 300-ohm circuits. Recommended input voltages are 6 and 12 v, respectively, with maximums of 8 and 16 v. Output at rated differential pressures is 2.000 ±0.005 mv per volt input. Cells are temperature compensated for zero and span. Calibration accuracy is within ¼ per cent of full scale anywhere within the rated range.

32—MAGNETIC CLARIFIER HAS HIGH EFFICIENCY

A Houdaille magnetic clarifier, introduced by the Honan-Crane Corp. is said to remove over 98 per cent of contaminants from liquid coolants and provides continuous delivery of clean coolant to machine sump for re-use. It has been designed for individual application on machine tools, such as wet surface grinders, thread grinders, milling machines and gear shapers. Removal of metallic and abrasive particles is accomplished by use of permanent ring magnets completely enclosed in revolving non-magnetic cylinder. Circular steel discs, end pieces of the cylinder acting as magnetic poles, seal off the magnet coves to prevent fluid from coming in contact with magnets. This design provides 360 deg of constant magnetic attraction. Unit is rated at 20 gpm. If flow rate is increased beyond rated capacity excess coolant automatically overflows into base of unit before reaching magnetic field. While rated flow of clean coolant is delivered, overage is returned to the sump, thus preventing spillage when clarifier is operated above rated capacity. The unit is operated with a 1/12 hp, 60



cycle, 110-v single phase motor. Cycling pump on machine tool or a separate unit can provide flow. When gravity flow is possible, a special interchangeable inlet casting is supplied.

33—RESISTORS HAVE TRIPLE INSULATION

The Mullenbach Electric Mfg. Co.'s new resistors feature a resistance element triply insulated from the frame by two thicknesses of mica-fibreglass-silicone, plus high-

strength refractory porcelain insulators. The steel mounting strip serves as the frame for the resistor unit and operates at ground potential. A specially alloyed wire retains a uniform, constant resistance at all operating temperatures and minimizes corrosion, even at maximum temperatures. The open-coil windings are permanently spaced by specially molded grooves in the porcelain insulators. Free air circulation around resistance wires insures high heat dissipation. Single resistor units are available in small increment increases from ¼ ohm at 60 amp to 20 ohms at 5 amp. Rated voltage is 500 a-c or d-c. Where variations in resistance are required, the units may be combined in series or parallel circuits. For these purposes, they are available in both open-bank and enclosed-bank assemblies.

For more information use one of the convenient reply cards on page 101. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

34—ROTARY COMPRESSOR IS DIESEL-ENGINE DRIVEN

A large size portable air compressor has been announced by Ingersoll-Rand Co. It features a rotary type compressor unit, designated as the Gyro-Flow 600, that is capable of delivering 600 cfm of free air at 100 psi. Major advantages claimed by the manufacturer are simplicity and low cost of operation and maintenance, greater

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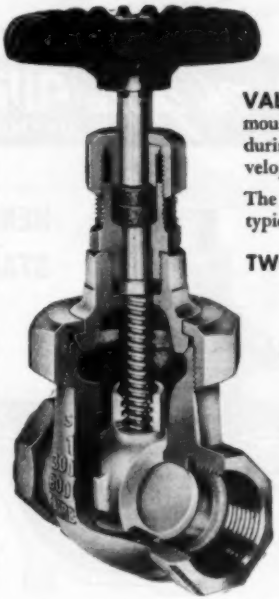

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The 0260—300 pound Bronze Gate Valve—is a typical valve, a typical value.

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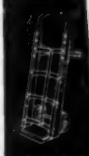
Strength, quick easy disassembly, no sliding or scraping of seat between body and bonnet.

RADIAL SEAT OF UNION BONNET . . .
Leakproof body-bonnet joint, rigid alignment.

SOLID NICKEL ALLOY WEDGE . . .
guided for tight closure, corrosion resistant.

Fig. 0260 BRONZE GATE VALVE—NON RISING STEM
300 lbs. steam working pressure at 550°F.
(0264—BRONZE GATE VALVE—RISING STEM)



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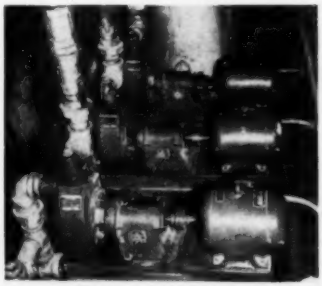

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☐ I attach description of a current pumping problem. Please make recommendations without obligation.

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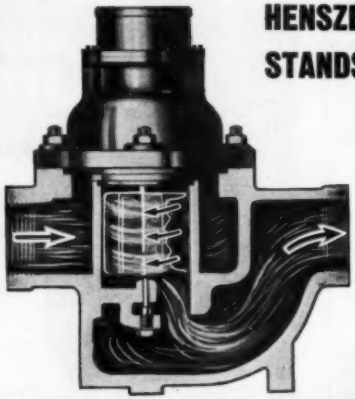

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35—PAINT SPRAY GIVEN ELECTRICAL CHARGE

Ashdee Products, Inc., have announced its Paint Miser that operates on the electrostatic attraction principle, and precipitates up to 95 per cent of the paint spray on the work. This greatly reduces overspray and cuts paint waste to the minimum. A negative charge is established in the paint particles as they leave the spray gun. The paint spray is attracted to the sprayed item as it is at ground potential. With this method, spraying from one fixed position, the paint spray can reach around corners, cover top, bottom and hard-to-get-at places with a smooth, uniform coating. The compact power supply unit is contained in a metal console cabinet with the control panel mounted on the top at a convenient operating angle. Overall dimensions are 18x18 x48 in.

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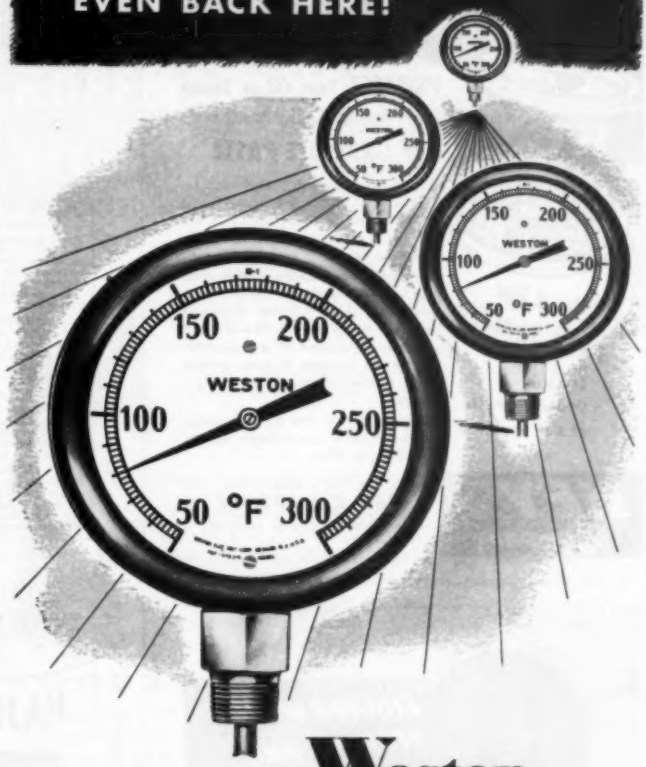

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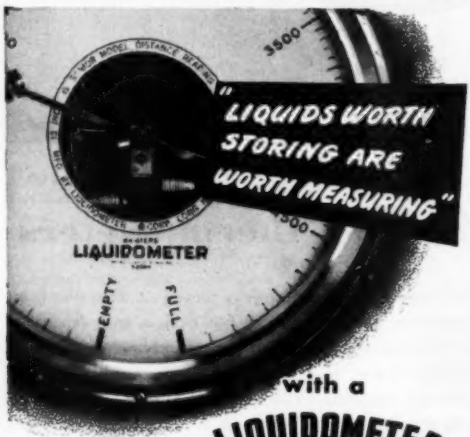

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(Continued from page 33)

To obtain any of these free booklets circle the corresponding number on one of the convenient post cards on page 101

chains are the subject of 4-page booklet. Gives safety rules and full data on inspection, use and care. Recommended load limits are listed in detail. Specifications are presented in tabular form. Cleveland Chain and Mfg. Co.

POWER TRANSMISSION

244—Roller Chain Flexible Couplings. Engineering information for proper application of roller chain flexible shaft couplings is given in 4-page folder. Includes dimensions, weights, service factors, and hp ratings. Shows examples of coupling selection and gives detailed data on two types of protective grease-retaining casings. Link Belt Co.

245—Variable-Speed Drive. All-metal variable-speed transmission with six outstanding features is presented in 8-page bulletin. Discusses the principle of operation and tells how all speeds to zero and reverse are obtained. Engineering data are diagrammed and charted, and specifications are tabulated. Available in standard and geared-head types with built-in or coupled motor. Wide choice of controls is offered. Graham Transmissions Inc.

246—Oil-Field Chains. Detailed presentation of riveted oil-field assembly is given in illustrated bulletin. Assembly provides the strength, long life and lower cost of riveted roller chain plus easy assembly and disassembly. Also included in the book is a description of oil-field chains including offset sidebar roller chains and A. P. I. chains. Roller chain couplings and sprockets are described and other oil-fired equipment is shown. Chain Belt Co.

247—Couplings. Piloted couplings that support a long shaft extension or floating shaft are illustrated and described in 6-page folder. Photos, drawings and diagrams show how units provide axial and torsional flexing action. Selection and dimension tables are included. The Falk Corp.

248—Tension Linkage. "Tension Linkage" as used in informative handbook describes any chain application in which linear movement of the chain is not continuous in direction. The predominating feature of tension linkage is that the chain need not be an endless belt. Numerous examples of tension linkages are shown and described in this bulletin. Various types of roller chains used in tension linkage applications are illustrated and described. Chain Belt Co.

PUMPS AND ACCESSORIES

253—Screw & Rotex Pumps. Warren's acquisition of the Quimby Pump Div.

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5 H.P. HOFFCO-VAC #50 PORTABLE

Improved design for high capacity, continuous cleaning. Operates two 50-foot lines of 1½-inch hose simultaneously, or one 75- or 100-foot length of 2-inch hose. 7½ cubic foot dust capacity – 48 sq. ft. of dust bag area. Write for Bulletin A-794.

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3 H.P. HOFFCO-VAC #30

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7½ H.P. HOFFCO-VAC #75

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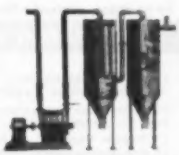

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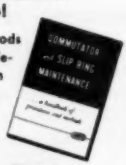

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255—Right Angle Pump Drives. The best means of driving a vertical pump with a horizontal driver is the Gearturbo says this manufacturer of vertical deep well turbine pumps. Especially where natural gas, gasoline, diesel or steam power is more economical or where standby power is desired. Construction features of the right angle gear head are given in 8-page bulletin along with sectional drawings and dimensions, details of the flexible shafts, hp ratings and suggested methods of application. Peerless Pump Div. Food Machinery & Chemical Corp.

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256—Brushes. Industrial brushing operations are fully covered in 76-page catalog designed to simplify selection of the best brush for the individual job. Photographs of brushes in actual use show various types of brushing setups. Section is devoted to factors involved in selecting the right unit for specific applications; also, operating equipment requirements, brush characteristics, operating conditions, surface speeds and other helpful information. The Osborn Mfg. Co.

VALVES, PIPING AND FITTINGS

260—Metal Bellows. Information in 20-page catalog will help you determine the bellows size, type, and material to fit your requirements. Describes manufacture, design consideration, specifications, fittings, typical types, and applications. Illustrations and diagrams are shown as is specification guide sheet. Chicago Metal Hose Corp.

261—Non-return Valve. Cushioned single-acting non-return valve is fully described in 6-page bulletin. Adaptability, testing, construction, installation, sequence of operation, servicing and specifications are covered in detail. Detailed drawings show three different yoke assemblies on elbow, angle and

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262—Chromium Stainless Steel Tubing. Current restrictions on the use of nickel in steel have forced engineers to investigate the use of straight-chromium stainless steel. Four-page bulletin outlining the physical and mechanical characteristics of three non-hardening straight-chromium stainless tubing steels may assist in solving the problem. Included are technical data on analyses, creep strength, forging, forming, machining, welding and heat-treatment. Babcock & Wilcox Tube Co.

263—Expansion Joints. Design and construction features of Yarway's Gun-Pakt and Glan-Pakt expansion joints are covered in 16-page bulletin. Packed with useful information. Tells you how to figure expansion of pipe lines, size, capacity and pressure loss of steam lines. Data on anchors for pipe lines also included. Gives 14 illustrations of typical expansion joint installations. Yarnall-Waring Co.

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265—Flange Design Manual. Third edition of 50-page manual reflects current thinking on the subject of flange design and brings to the designer a wider scope of practical suggestions and discussion aimed at increasing his understanding of the subject. Presents latest data and demonstrates calculations required. Flange formulas together with related data on bolting, gaskets, etc., are given in convenient form. Charts, tables and diagrams are included. Taylor Forge & Pipe Works.

270—Acid-Proof Pipe. Pipe and fittings for corrosive waste disposal systems are described in 8-page bulletin. Gives physical characteristics of the material along with advantages of using Duriron. Presents visual test of materials for acid drainage and lists the results of impact tests. Drawings show how to install the fittings for various applications. Lists miscellaneous uses including fume ducts, battery rooms and stations, roof vents, and cinder fills. The Duriron Co., Inc.

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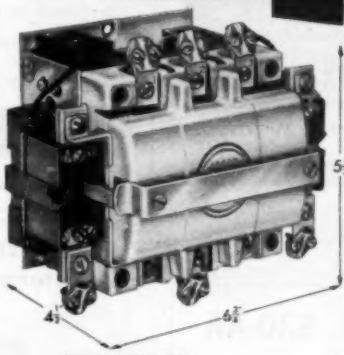

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274—Dust Collector. Effective dust control not only lengthens the useful life of equipment and lowers maintenance and repair costs but also promotes worker efficiency and removes health hazards. How aerodynamic forces are utilized to collect dust is shown in 8-page bulletin. Diagrams and drawings illustrate the principles and equipment. Aerodyne Development Corp.

275—Draft Gages. Of interest to heating, ventilating and air-conditioning men is 20-page bulletin. Describes and illustrates portable, stationary and laboratory type inclined draft gages and accessories. Tables and useful data are presented as are instructions for securing readings in conjunction with pitot tubes. Ellison Draft Gage Co.

276—Fin-Tubes. Integral extended surface Fintubes are covered in 8-page bulletin. Illustrates the wide variety of heating and cooling applications in which they are used and gives three pages of helpful engineering data. Includes design curves and tabulation showing the comparative outside surface areas provided by different sizes of bare pipe and longitudinally finned pipe or tubing. Range of sizes and materials are listed. Brown Fintube Co.

277—Dust Collector. Hydro-static precipitator in which the cleaning action is obtained with an inverted S-shape water curtain is pictured and described in 20-page bulletin. Four different arrangements are shown, and dimensions and specifications are given for each. Cutaway views illustrate the action of

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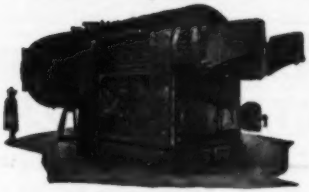

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the units. Water-level controls are discussed and performance characteristics are given. Four pages of engineering data are included. American Air Filter Co., Inc.

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278—Cutting & Grinding. Factual data concerning more than fifty typical metalworking jobs is presented in 80-page booklet. Excellent opportunity to discover ways of speeding production, improving finishes and prolonging tool life. Also presents descriptions of Sun's straight and emulsifiable cutting oils. Of practical use to the shop man is chart showing the correct cutting fluids for many of the most frequently used metals and metalworking machines. Send requests on your company letterhead. Sun Oil Co.

279—Colloidal Graphite. Colloidal graphite treatment of glass mold surfaces is described in 4-page bulletin. Explains how dispersing graphite in colloidal form in a fluid carrier makes it adaptable to the glass field. Also given is information on pretreating molds with various colloidal graphite dispersions, along with explanations of the many types of mold oil. Acheson Colloids Corp.

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281—Heat-Resistant Finish. Commercially priced, silicone-base finish which can be applied by brush, spray, or dip, and which either air dries or adapts itself to any existing force drying system is described in 4-page bulletin. Gives case histories showing how many difficult finishing problems were solved. Photographs and cutaway views show some of the products finished in Sicon. Midland Industrial Finishes Co.

282—Parting Compound. How colloidal graphite dispersions are used as parting compounds in various industries is described in 6-page folder. Given are well-illustrated details of many specific applications such as the parting of sintered metal clutch plates from each other, the separation of ingots from molds, and the removal of glass forms from molding machines. Unaffected by heat up to 3500 F and particularly effective on screw threads of bolts and nuts according to the bulletin. Acheson Colloids Corp.

For more information use one of the convenient reply cards on page 101. No postage necessary. Insert the key numbers of items about which you want additional information mailed to you.

283—Tank Lining. Practical application of thick protective brush-on coatings for tank and duct linings is covered in data sheet. Resistant to all acids except oxidizing types, and to practically all solvents and alkalies. The bulletin tells how to apply the coating; gives coverage, drying and working times; uses and prices. Carboline Co.

284—Steel Rolling Doors. For half a century this company has specialized in manufacturing doors and door-opening equipment. If you're seeking information on doors this 28-page bulletin that's chock-full of data should fill your needs. Illustrated with photos and cutaway views along with line drawings. The Kennear Mfg. Co.

285—Lubricant Data Book. The answer to the problem of securing maximum over-all efficiency in lubrication lies in determining the kind and quality of the lubricant, and the method of application that is best suited to each case. This 56-page data book will show you how to select the correct lubricant for a particular application. Lists equipment in almost every industry and gives specific lubrication recommendations along with other valuable information. Fiske Brothers Refining Co.

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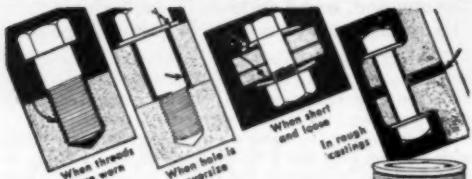

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"SPOT" NEWS OF INDUSTRY

(Continued from page 97)

mation to do whatever it deems necessary in the interest of the defense effort. Some of the things it said it may do to attain this objective are:

Direct the return or cancellation of any order on the books of the manufacturer.

Direct changes in production or delivery schedules.

Require manufacturer to fill orders as N.P.A. determines.

Allocate orders placed with any manufacturer to another manufacturer or manufacturers.

Included in the type of heavy power equipment affected by this order are steam turbines, hydraulic turbines, internal-combustion engines including oil diesels, steam turbine-generator sets, hydraulic turbine-generator sets, engine-driven generator sets, electric generators, steam boilers, coal pulverizers, steam condensers, oil circuit breakers, air circuit breakers, power switchgear, metal-clad switchgear and transformers with a capacity of 501 kilovolt-amperes designed to operate over 15 kilovolts.

The agency added its order was designed to insure that a Government sponsored expansion program in the electric power industry is carried out and that the use of critical materials in production of less essential units is prevented.

The N.P.A. also said that priority assistance may be given to manufacturers of heavy power equipment who have trouble getting copper, steel and aluminum they need to meet the approved objectives of the expansion program.

Decatur, Ind. and Robstown, Texas Increase Their Municipal Power Plant Electrical Capacity

Two large Hamilton diesel engines, one among the largest in the United States, are reported sold by Baldwin-Lima-Hamilton Corp. to Decatur, Ind., and Robstown, Texas. The engines will be used to generate electrical power.

The engine for Decatur is a 12-cylinder, two-cycle diesel with 21½-in. bore and 27½-in. stroke, having a rating of 5370 bhp and 74 bmep at 240 rpm. It is designed for easy modification for dual-fuel operation on oil or gas, if desired later.

For its municipal power plant, Robstown has purchased a six-cylinder dual-fuel diesel. This engine has a rating of 483 bhp per cylinder at 257 rpm or a total of 2900 hp. It provides a power increase of more than 70 per cent over six gas engines now operating.

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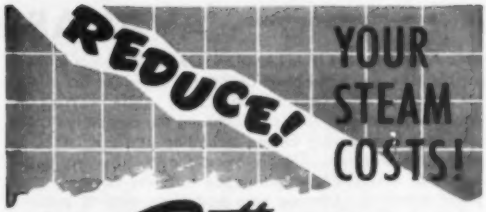

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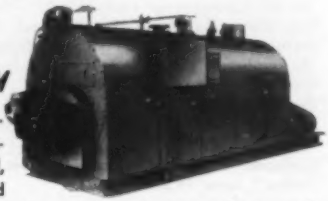

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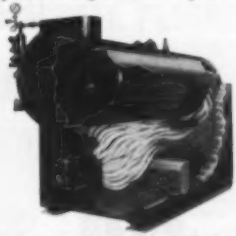

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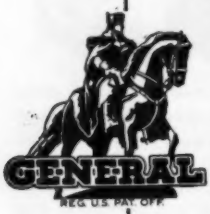

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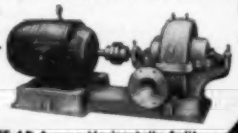

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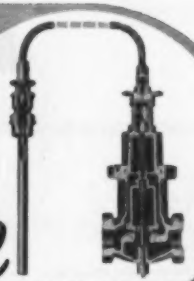

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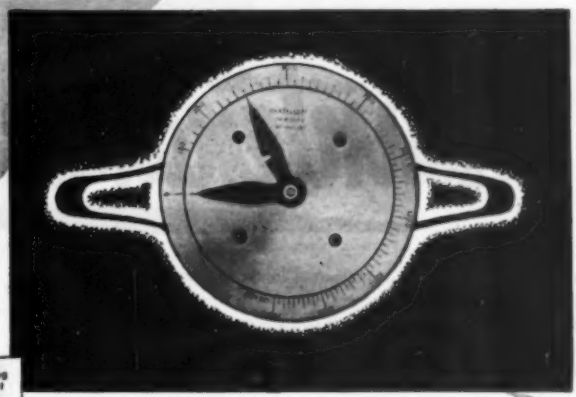

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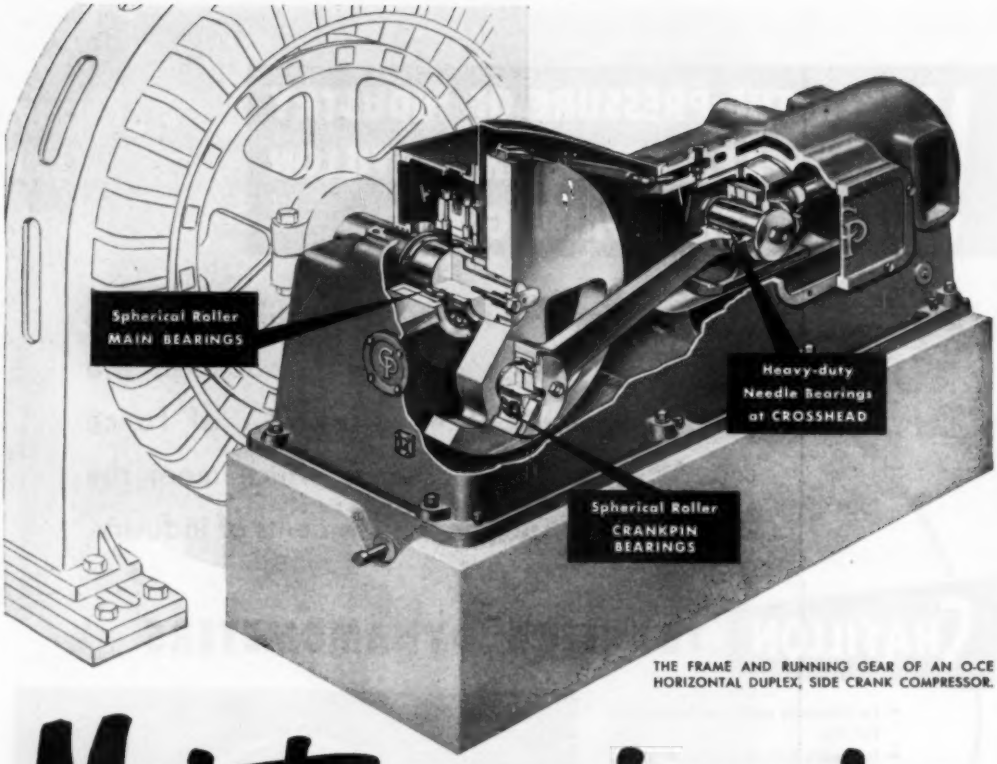

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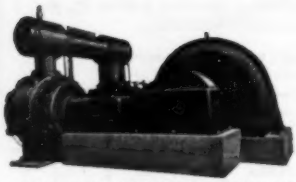

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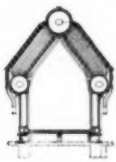

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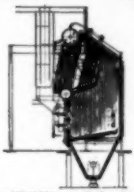

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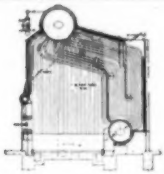
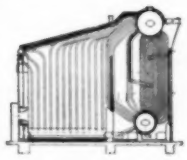


Type-S 2 Drum Boiler Series 51



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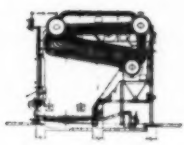

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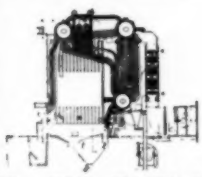
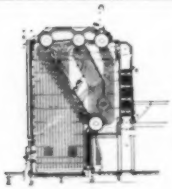
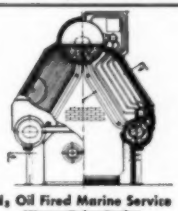


3 Drum "B" Type Water Tube Boiler



4 Drum Water Tube Boiler



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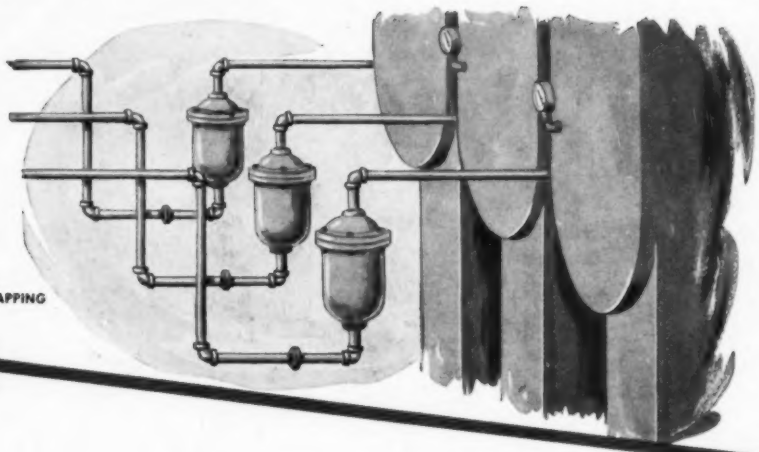

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